

INTERNATIONAL INSTITUTE OF AGRICULTURE
BUREAU OF AGRICULTURAL INTELLIGENCE AND PLANT DISEASES

MONTHLY BULLETIN
OF AGRICULTURAL INTELLIGENCE
AND PLANT DISEASES

NR IV - NUMBER 10

OCTOBER 1913



*** ROME: PRINTING OFFICE OF THE INSTITUTE. 1913. ***

In quoting articles, please mention this BULLETIN.

CONTENTS

FIRST PART: ORIGINAL ARTICLES.

U. ERNST. The Present State of Agricultural Education in Austria	page 1471
TEEL, CHR. Recent Work of the Bacteriological Section of the Central Agricultural Experiment Station at Experimentalfället near Stockholm	" 1478
SEN, H. C. Organization of Field Experiments in Denmark	" 1479
BERGMAN. The Possibility of Replacing Potash Salts by Finely Ground Phosphates, Leucite, etc.	" 1483
MACI, F. The Present State of Olive Growing in Italy	" 1496
BRANDER, E. O. The Recent Development of Cattle Breeding in Sweden . . .	" 1502

SECOND PART: ABSTRACTS.

AGRICULTURAL INTELLIGENCE.

I. — GENERAL INFORMATION.

ATION AND EXPERIMENTATION IN AGRICULTURE AND FORESTRY. — 1126. National School of Waters and Forests at Nancy, France. — 1127. Travelling Schools for Rural Domestic Economy (France).

CULTURAL INSTITUTIONS. — 1128. The Agricultural Institutions of Spain. — 1129. The Financial Measures of the Prussian Chambers of Agriculture. — 1130. Resolution of the Swedish Authorities on the Future Position of the Swedish Station for the Improvement of Seeds.

CULTURAL SHOWS AND CONGRESSES. — 1131. Agricultural Shows. — 1132. Agricultural Congresses.

II. — CROPS AND CULTIVATION.

a) GENERAL

PHYSICS, CHEMISTRY AND MICROBIOLOGY. — 1133. The Circulation of Sulphur and Chlorine on the Earth. — 1134. The Condition of Soil Phosphoric Acid insoluble in Hydrochloric Acid. — 1135. The Question of the Inoculation of New Crops on Moor Soil. — 1136. Experiments on Denitrification.

WATER IMPROVEMENTS. — DRAINAGE AND IRRIGATION. — 1137. Irrigation Resources in Florida and their Utilization. — 1138. The Murrumbidgee Irrigation Scheme in New South Wales.

MANURES AND MANURING. — 1139. Comparative Manuring Experiments with Crushed Potash and 40 per cent. Potash Salts. — 1140. The Sulphur Industry and Trade in the United States.

b) SPECIAL

- AGRICULTURAL BOTANY. — CHEMISTRY AND PHYSIOLOGY OF PLANTS.* — 1141. Experiment on the Availability of Glucosamine Hydrochloride as a Source of Nitrogen for the Nutrition of Maize and Beans.
- PLANT BREEDING. — 1142. New Selection Varieties from Alpine Forms of Fodder Grasses. — 1143. Selection of Pigeon-Pea or Rahar.
- FORAGE CROPS. — MEADOWS AND PASTURES. — 1144. Comparative Experiments on Red Clover of Different Origins at the Svalöf Institute. — 1145. Manuring Experiments on Alpine Pastures in Carinthia. — 1146. *Desmodium hirtum*. Leguminous Forage Plant for the Prevention of Weeds for Tropical Crops.
- FIBRE CROPS. — 1147. Cotton Problems in Louisiana. — 1148. Cotton in India. — 1149. The Jute Industry. — 1150. Sisal Hemp in German East Africa.
- OIL CROPS. — 1151. Elaeis Fruits without Stones. — 1152. Contribution to the Study of the Castor-oil Plant.
- RUBBER, GUM AND RESIN PLANTS. — 1153. Plantation Rubber in Hawaii.
- VARIOUS CROPS. — 1154. Experiments in Manuring on a Tea Estate in Darjeeling. — 1155. Cultural Experiments with Medicinal Plants at Kornenburg in 1912. — 1156. Cultivation of Lavender in the South-East of France.
- MARKET GARDENING. — 1157. An *Allium* from the Mediterranean Region which might be used as a Vegetable.
- FRUIT-GROWING. — 1158. The Sexual Organs of Vine Hybrids. — 1159. The Reconstitution of Swiss Vineyards. — 1160. Manuring of Coconuts in the Seychelles.
- FORESTRY. — 1161. The Forests of Taiwan (Formosa). — 1162. Experiments on the Influence of Manure in Nurseries.

III. LIVE STOCK AND BREEDING.

a) GENERAL

- HYGIENE. — 1163. The Cause of Fagopyrism. — 1164. Four New Species and Two New Varieties of the Ixodid genus *Hamaphysalis*. — 1165. New Species of *Ixodes*.
- ANATOMY AND PHYSIOLOGY. — 1166. Distribution of Creatin in the Bodies of Mammals. — 1167. A Calorimeter for Small Animals. — 1168. The Effect of Previous Nutrition upon Metabolism during Fasting. — 1169. The Influence of the Ingestion of Sodium Nitrate on Nitrogen Exchange. — 1170. Effect of the Iron Content of Blood Meal upon the Iron Assimilation of Animals fed with it.
- FEEDS AND FEEDING. — 1171. The Relation of Growth to the Chemical Constituents of the Feed. — 1172. Sorghum Crops for Silage. Feeding Experiments with Dairy Cattle. — 1173. Manioc Roots and the Residues of their Elaboration.
- ENCOURAGEMENT OF BREEDING. — 1174. The Show of Breeding Stock at Souk-Ahas, Al

b) SPECIAL

- HORSES, ASSES AND MULES. — 1175. Modifications in the Exterior Conformation of the Blood Horse during Growth, in Prussia.
- CATTLE. — 1176. Cattle Breeding and its Importance in German East Africa. — 1177. The Black Cattle. — 1178. Carcase Test of the Piedmontese Breed of Cattle. — 1179. The relation between the Percentage of Milk Fat and the Quantity of Milk Produced by Friesian Cows. — 1180. Investigations into the Daily Variations in the Specific Gravity and Fat Content of the Milk of a Large Herd. — 1181. The Possibility of Increasing, with Economic Advantage, the Average Fat Content of Cow's Milk.

CONTENTS

- P. — 1182. Improvement of Sheep-Breeding in Algeria.
TRY. — 1183. Fourth Egg-laying Competition in Tasmania. — 1184. Ostrich Farming in Australia.
I. — 1185. Further Report on the Isle of Wight Bee Disease.
OCS. — 1186. Domesticated Reindeer in Newfoundland.

IV. — FARM ENGINEERING.

- CULTURAL MACHINERY AND IMPLEMENTS. — 1187. Motor Plough Competition at Königsberg.
— 1188. An Egyptian Water-Lift. — 1189. Automatic Drinking Trough for Pigs. — 1190.
A New Apparatus for Milk Sterilization.

V. — RURAL ECONOMICS.

- Systems of Land Tenure Prevalent in the Plain Belt of the Province of Treviso, Italy. — 1192.
Persons engaged in Agriculture in Prussia, according to the Census of June 12, 1907. — 1193.
The Farmer's Income in the United States. — 1194. Notes on Tobacco-Growing in Germany.

VI. — AGRICULTURAL INDUSTRIES.

- INDUSTRIES DEPENDING ON ANIMAL PRODUCTS. — 1195. Practical Formula for the Calculation of the Solids not Fat of Milk. — 1196. The Specific Gravity of Cow's Milk and the Change it Undergoes shortly after Milking. — 1197. Practical Methods for the Determination of Fat in Cheeses, with Special Regard to the Processes of Kooper and Wendler. — 1198. The Consumption of Meat and Milk in Japan in 1911. — 1199. Annual Wool Review for Australasia. — 1200. Experimental Contribution on the Subject of the Disinfection of Hides and Fleeces containing Anthrax Spores.

- INDUSTRIES DEPENDING ON PLANT PRODUCTS. — 1201. Notes on the Vine-Growing Districts of Chile. — 1202. The Wines of Tokay and a Comparison with those of Sautes. — 1203. Influence of Ferments on the Variations in Dry Extract and Glycerine in Wine. — 1204. Plum Brandy; Improvements in its Manufacture.

PLANT DISEASES.

I. — GENERAL INFORMATION.

- LEGISLATIVE AND ADMINISTRATIVE MEASURES FOR THE PROTECTION OF PLANTS. — 1205. The First International Conference of the "Defensa Agrícola" at Montevideo.

II. — DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

5. The Cause Determining the Chlorosis of American Vines and the Method of its Control. — 1207.
On the Presence of Endocellular Fibres in Healthy Vines and in those attacked by "Bramble-Leaf".

III. — BACTERIAL AND FUNGOID DISEASES.

a) GENERAL

FUNGOID DISEASES. — 1208. Recent Researches on Vine Mildew. — 1209. Conditions favourable to the Development of Mildew.

MEANS OF PREVENTION AND CONTROL. — 1210. Comparative Spraying Experiments with Commercial Fungicides.

b) SPECIAL

BACTERIAL AND FUNGOID DISEASES OF VARIOUS CROPS. — 1211. Some Interesting Fungoid diseases which appeared in Hungary in 1912. — 1212. *Sclerotium Oryzae* on Rice in Ind. — 1213. *Lasiodiplodia Theobromae* parasite on Cacao in Dahomey. — 1214. "Soft Rot" of *Isia maculata* and *Gladiolus Colvillii* produced by *Bacillus Ixiae* n. sp. and *Pseudomonas gladioli* n. sp. — 1215. Dik-voet, Club-root, or Finger-and-toe (*Plasmodiophora brassicae*). South Africa. — 1216. "Ferrugem du pimenteira" (*Puccinia Capsici* n. sp.) on Various Species of Capsicum in the State of São Paulo, Brazil. — 1217. A Die-back Disease *Pseudotsuga Douglasii* produced by a Variety of *Sphaeropsis Elaeagni*.

IV. — PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

1218. *Avena fatua* and other Species of *Avena*, with their Hybrids, as Weeds of Cereals in France in 1913.

V. — INSECT PESTS.

a) GENERAL

MEANS OF PREVENTION AND CONTROL. — 1219. *Leucopis nigricornis*, a Natural Enemy of *Pultinaria camelicola*.

b) SPECIAL

INSECTS AND OTHER INVERTEBRATES INJURIOUS TO VARIOUS CROPS. — 1220. *Adia acuminata* a Hemipterous Pest of Cereals in Algeria. — 1221. *Heterodera radicola* on the Root of *Scirpus sylvaticus* in Silesia. — 1222. The Hop Aphis in the Pacific Region. — 1223. *Aphrophora spumaria* on Roses and Pinks. — 1224. *Pyramella cardui* on Artichokes in France. — 1225. *Nysius senecionis* attacking Vines recently planted. — 1226. Some Animal Insects on *Prunus* in France. — 1227. *Melittoma insulare* and *Rhina nigra*, Beetles injurious to Coconuts in Madagascar. — 1228. Insect Injurious to Papaw Apples: (*Dichocrois fovealis*). — 1229. Deformation of the Flowers of *Fragaria Vesca* caused by *Eriophyes* in Sicily.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART. ORIGINAL ARTICLES

The Present State of Agricultural Education in Austria

by

Prof. ERNST VITAL,

Director of the «Francisco-Josephinum» Agricultural Institute at Mödling.

In Austria, or rather in the countries represented in the Austrian Empire (Cisleithania), agricultural education is imparted in technical agricultural schools and by travelling lecturers. These two forms of tuition are not sharply distinguished from each other, for often the teaching staff of the schools act as travelling lecturers, while some of the latter hold courses which resemble those given in the schools, differing from them only in the duration of shorter duration.

A. — TECHNICAL AGRICULTURAL SCHOOLS.

These schools date back to the eighteenth century. The first of them were founded on the initiative of private persons, some of whom were large landowners who had recognized the necessity of technical agricultural instruction. With the development of agricultural cooperation, the cooperatives (even some of the smaller ones) founded schools of agriculture. Especially in the sixties, this movement became very active and most of the agricultural schools in Austria owe their origin to private initiative, chiefly to that of agricultural associations.

At first some uncertainty prevailed as to the objects and extent of new schools; only later, in the seventies, did they begin to differentiate according to their several aims. As soon as a Ministry for Agriculture was created in Austria (in 1868) it took an especial interest in agricultural education. After consultation with the most competent persons and institutions the Ministry issued a series of decrees with the object of giving a first impetus to agricultural education.

To that period is due the present distinction of higher, medium and lower agricultural schools. This sharp distinction distinguishes the Austrian agricultural school system from that of most countries, in only a very few of which this systematic graduation from the highest to the lowest school has been adopted.

1. *Higher agricultural education.* — In Austria those institutes which give the highest scientific instruction in all the branches of agriculture, and which admit only those pupils who possess a good general preparation and the leaving certificate (*Mittelschulmatura*) of medium schools, are considered as agricultural colleges.

The subjects taught are not only the purely technical ones, but comprise also all those scientific subjects which concur in making up a higher culture. The course has a duration of four years and gives the necessary knowledge for managing large estates and for teaching in colleges and medium schools as well as for scientific research work in agriculture; it also enables students of other professions to gain useful knowledge concerning the cultivation of the soil. At the end of the course there are three State examinations (*Staatprüfungen*) to be passed. Besides this the students may obtain the academic degree of doctor in agriculture (*Doktor der Bodenkultur*) on presenting a thesis and submitting to severe examinations.

At present the following colleges exist in Austria:

1. Vienna (*Hochschule für Bodenkultur*), consisting of three sections: agriculture, forestry and rural engineering; tuition is imparted in German.
2. Krakau, the agricultural section of the University of Krakau, in which teaching is in Polish.
3. Prague, at the Bohemian University, in which Czech is the language used.

All these three colleges are under the Ministry of Instruction.

Besides these completely equipped colleges there are also agricultural chairs at the following technical colleges: Vienna (German), Graz (German), Prague (German and Bohemian), Brünn (German and Bohemian) and Lemberg (Polish). The object of these chairs is to complete the instruction of the students of the technical colleges, especially of the engineering section.

2. *Agricultural Academies.* — At first, besides the higher education in agriculture, there were only the medium and lower schools. Towards the end of last century an intermediate school has been introduced between the higher and the medium schools; it is called the agricultural academy and imparts instruction as in the colleges, from which it differs in that its course lasts two years, or if desired three years, instead of four. The academy admits pupils from the medium schools of general culture and from agricultural medium schools.

There are at the present time three agricultural academies, which are regional institutions, and like all the following agricultural schools are under the control of the Ministry of Agriculture.

While the Colleges do not possess any farm attached to them, or only an experimental one, the agricultural academies have large farms for experiment.

tal and educational purposes, and they give their students the theoretical and practical knowledge required for the management of large estates.

3. *Medium Agricultural Education.* — The students who have been through the agricultural medium schools are also capable of managing small and moderate-sized estates, and they can, as well as those from the families, on conforming to the regulations, become teachers in the lower agricultural schools. These medium agricultural schools are open to all who have passed the lower four classes of a middle school for general culture or the last three classes of a secondary school (Bürgerschule).

Instruction in these schools is chiefly theoretical, but where possible practical tuition is also given, as almost all of them dispose of a completely equipped school farm. Students who have obtained their diploma may, after passing an examination before a commission in the presence of a government official, be admitted as one-year volunteers in the army.

There are at present in Austria nine medium agricultural schools; in six of these German is spoken, in four Bohemian and in one Polish. With one exception they are regional institutions. There are, besides, two special schools, one of which is the Klosterneuburg higher school for vine and fruit growing, which is a State institution, and the other the horticultural school at Eisgrub, a private institution, but subventioned by the State and officially recognized.

4. *Elementary Agricultural Education.* — The number of lower agricultural schools is much greater than that of the above-mentioned schools. Their object is the spread of agricultural knowledge among the peasant population. At first there were only elementary agricultural schools for boys, but these were also opened for girls.

In some schools for boys the course is a two-years one (Ackerbauschule), but in others its duration is only of one or two winter half-years (Winterschulen). The first are the oldest, and they receive pupils who possess the general education that is given in the primary schools (Volksschulen); theoretical and practical instruction (the latter on the school farm) are given. The object of these schools is to form a class of better educated peasants and also foremen and foremen for large estates.

The number of these schools is forty-two, of which thirteen are German, fifteen Bohemian, seven Polish, two Slovenian, two Italian and four equal.

1 The number of agricultural winter schools is constantly increasing, and among the schools for the peasantry they have proved to be the best. As the winter schools are open only during the five or six months of the worst season and as but few of them possess a school farm, the instruction given is chiefly theoretical and includes subjects of general education as well as agriculture. The commencement of the courses is regulated according to the climatic conditions of the locality. In most of the winter schools a second winter course follows the first, so that in reality the course covers ten to twelve months.

In general such good results have been obtained with the two-course winter schools that at present the tendency is to found two-course winter

schools and to convert into such the one-course schools. For admittance them the pupils must possess the elementary knowledge given by primary schools. The pupils work during the summer, between the two courses, on their fathers' farms; with the present scarcity of rural labour this is a great advantage. After having frequented these schools they generally remain on their parents' farm, in the improvement of which they use the acquired knowledge, and at the same time set an example to their neighbours.

In 1913 there were 91 winter schools; some are regional, others association or private institutions. There are, besides, some schools which are similarly organized, but which devote themselves to some special branch such as vine-growing or market gardening.

Such special branches are also treated in some lower schools in a one-year's course lasting ten or twelve months or less. Their object is to improve pupils in market gardening, fruit or vine growing, in the cultivation of hops or meadows, and in dairying or other special branches of agriculture; consequently they have been founded where these particular forms of farming are prevalent. Their number is now 24.

5. *Agricultural Instruction for Girls.* — In the nineties the opinion began to gain ground that instruction limited only to boys was not sufficient because in farming in general, and especially in some branches, the influence of the women in the family is very great. Thus the necessity of providing technical instruction for women also was recognized and the first housekeeping schools were founded with the object of teaching farmers' daughters the domestic management of a farm house, together with some notions of agriculture. These schools are not all of them organized on the same line. There is one housekeeping school which bears the title of agricultural school for girls. In order to be admitted to it a fairly good preparation is demanded, such as is given by the secondary schools (*Bürgerschulung*), training schools for teachers or high schools. Besides housekeeping teaches agriculture systematically, the curriculum being about the same as in the practical schools of agriculture (*Ackerbauschulen*), so that the girls on leaving the school are not only qualified to manage a large farm household, but can also act as assistants on a farm or teach in agricultural housekeeping schools.

The other agricultural housekeeping schools, which demand as preparation for admission only the knowledge acquired in the elementary schools, are divided into those whose course extends over a whole year and those in which it is limited to five or six months.

Besides the above, there are also the so-called summer housekeeping schools attached to the agricultural winter schools. They have the same objects in view as the housekeeping schools and a similar curriculum, but they differ chiefly in the shorter duration of instruction (three to five months) as well as in the time of year during which they are open, generally from April 1.

The most important data on the agricultural schools as they were during the scholastic year 1912-13 are the following:

Institutions for Agricultural Education in Austria.

Institutions	State	Regional	District or association	Private	Total	Staff		Number of students	Scholarships	
						Perma- nent	As- sis- tants		Number	Yearly amount
es and Sections of Uni- versities	3	—	—	—	3 ¹⁾	92 ¹⁾	58 ¹⁾	1 637 ¹⁾	147 ¹⁾	£ 2 774
agricultural schools	—	3	—	—	3	52	19	342	64 ²⁾	1 606
technical schools	1	8	1	1	11	97	60	1 274	103	1 172
primary schools	1	26	13	1	41	169	186	1 486	484	4 530
winter schools	—	55	33	3	91	251	610	3 370	921	2 753
special schools	—	19	14	1	34	110	99	868	240	1 794
housekeeping schools, 12 years' course	—	—	—	1	1	6	8	22	—	—
housekeeping schools	—	4	13	5	22	100	63	630	44 ³⁾	277
Total	5	113	74	12	206	785	1 045	7 992	1 856	12 132

(1) In the expenses of the colleges those of the forest section and of the rural engineering sections of the Vienna agricultural school are included; for this reason these expenses are not comprised in the total.

(2) Including 12 free places.

(3) In the last budget only two extraordinary grants of £96 are included.

— TRAVELLING AGRICULTURAL LECTURESHIPS AND SPECIAL COURSES.

Regular agricultural school education is, under present conditions, available for only a limited number of intending farmers. Consequently it is sought to use other methods besides schools to promote the spread of agricultural instruction. These methods are travelling lectureships and special courses. The lectures are given either by travelling lecturers specially appointed for the purpose or by some of the teachers of agricultural schools, both classes of lecturers visiting in turn the various localities of a district.

While the travelling lecturers in the southern districts, such as Dalmatia and Croatia, which are less developed from an agricultural point of view, are appointed by the State, in all the other parts of the Empire they are appointed by independent local authorities or of the principal agricultural corporations and associations; nevertheless the State contributes in most cases towards their salaries.

For all the crown lands, regulations have been drawn up for the carry out of this service.

As the effect of a lecture is in general but slight, the lecturer is bound the regulation to keep himself posted in the progress of his territory, to be in touch with the rural populations and to assist the people with advice action in any difficulty connected with farming.

Among the duties of the lecturer there is also the holding of courses which may last a day or more, in order to instruct farmers, anxious to learn in certain branches of agriculture, such as dairying, live stock keeping, poultry keeping, fruit tree grafting, forage growing, etc. Such courses are often held by teachers of the winter or other agricultural schools during their free time, either in the same schools or elsewhere, and contribute efficiently to the spread of modern farming methods. These courses are not limited to the men and boys only, but extended under the form of lectures on cooking and domestic economy to the women also.

All the members of the teaching staff, whether travelling or otherwise must before being definitely appointed pass an examination as to aptitude for teaching. This examination is held at one of the colleges in Vienna or in Prague, and is divided into an examination for medium schools and for lower schools. There are, besides, examinations for fruit and vine growing and for agricultural housekeeping schools. For these examinations there are special regulations drawn up by the Ministries for Education and Agriculture.

As agricultural instruction in Austria is not all under one single control but is managed partly by the State and partly by other bodies, such as governments, district municipalities, associations and even by private persons, it is not easy to ascertain the amounts of the sums spent for this object. Nevertheless, from the following data concerning the expenses and contributions of the State, which form only a small part of the whole, some idea of the outlay may be formed.

The budget for 1913 contains the following figures:

1. In the budget of the Ministry of Instruction, under whose control are all the Universities and Colleges are situated, consequently also the agricultural sections of the Vienna College, of the Czech Polytechnic of Prague and of the University of Krakau, the allotments for agricultural instruction are not given separately, but only the lump sums for each institution. Nevertheless these figures show the amount of the contribution of the State for this branch of education.

In the budget for 1913 the estimates for the Vienna College are set down at £. 28356, of which about one half may be considered as devoted to the agricultural section. There is besides a special credit of £. 1742 provided for Higher agricultural education shares also for an amount which is not stated in the sums voted for the Czech Polytechnic of Prague, viz £. 57078 ordinary expenses, and £. 18892 extraordinary ones, and in those of the University of Krakau, namely £. 31450. Of these sums between one-fourth and one-third may be safely reckoned as being spent upon agricultural education. It is also to be noted that the cost of the chairs of agriculture

the Polytechnic schools of Vienna, Gratz, Prague, Brünn and Lemberg
-90 to be included in the sums spent on higher agricultural education.
2. In the budget estimates of the Ministry of Agriculture, upon which
be other schools of agriculture depend, the following figures are in-
ed:

1) For the State Institutes of Klosterneuburg, Spalato and Glavica, ordinary expenses	£ 10 046
Extraordinary do	" 83
Total	<u>£ 10 129</u>
2) For grants to agricultural schools not belonging to the State, as well as for travelling lectureships and special courses, ordinary expenses	£ 28 750
Extraordinary do.	" 15 000
Total	<u>£ 43 750</u>
3) For the spread of means for agricultural instruction, for scholarships, subventions, travelling expenses, expenses for State inspectors of subventioned schools, for the commissions of examiners of teachers of agriculture and forestry, ordinary expenses . . .	<u>£ 8 333</u>
4) For travelling lecturers and special courses, which are partly (in Dalmatia and Illyria) instituted by the State and to a greater extent by the local Governments and by the principal agricultural associations, further for the cost of agricultural instruction to soldiers and for the upkeep of model farms, ordinary expenses	£ 15 417
Extraordinary do.	" 4 167
Total	<u>£ 19 584</u>

According to the above the total outlay of the State for agricultural
nation, excepting college education, is:

1) For State Institutions,	£ 10 129
2) For subsidizing institutions not belonging to the State . . .	" 43 750
3) For general agricultural education.	" 8 333
4) For travelling lectures and special courses	" 19 583
Total	<u>£ 81 795</u>

From these figures it may be seen that the State takes a special interest
gricultural education; by comparing them with those of the previous
it will be seen how rapidly the outlay for this object has increased.
increase is explained not only by the increased number of institutions
for instance, in 1912, eight new ones have been opened), but also by
greater demands of efficiency made upon them.

Recent Work of the Bacteriological Section of the Central Agricultural Experiment Station at Experimentalfället, near Stockholm

by

CHR. BARTHEL,

Chief of the Section.

The Bacteriological Section undertakes research and experiments in agricultural microbiology in general. This work includes the bacteriology of the soil, of manure and of dairy produce; the subjects are often treated in conjunction with other sections of the Institute.

The work on soil microbiology has been concerned with methods of investigation, and more recently with the influence of organic substances on nitrification and denitrification in the soil. Just now, the decomposition of farmyard manure in the soil, both alone and in presence of lime, is attracting attention. The changes of a biological nature induced in the soil by farmyard manure have so far been insufficiently explained.

In collaboration with the Botanical and Agricultural Sections, numerous trials have been made with different cultures of leguminous and non-leguminous organisms, such as Bottomley's "Nitrobacterin", Simon's "Azotogen" and cultures prepared by us. "Nitrobacterin" contained no living bacteria, and consequently produced no effect; "Azotogen" gave very good results and the results of experiments with the cultures prepared in our own laboratory were likewise satisfactory.

On the subject of the fermentation of farmyard manure, work has been undertaken in collaboration with the Agricultural Experiment Station on the possibility of preserving the ammoniacal nitrogen of the manure by the addition to it of whey from cheese-factories. Some years ago it was found that the common lactic ferments occurred in great numbers in farmyard manure; by supplying them with carbohydrate material, such as sugar, one ought to get a fermentation in which the acids produced fix the ammonia of the manure, thus preventing the usual loss of nitrogen in this form. Chemical and bacteriological analyses, as well as field trials carried out by the Agricultural Section of the Institute, have shown that this treatment of manure (0.25 and 0.5 per cent. of milk sugar being added) has the expected effect, and the manure gives considerable increase of crops when kept in the ordinary way.

Bacteriological work on dairy questions has also taken up a good deal of time.

Firstly, a satisfactory method for judging the quality of dairy products from the hygienic standpoint was sought for. The reductase test was found

swer the requirements in this case. It is very easy to carry out and a very fair approximation of the number of micro-organisms present in milk. The result has been that the method has spread widely, both in Denmark and in other dairy countries. In the Swedish dairies, where the use of milk is now beginning to be fixed on its hygienic qualities, as well as fat-content, the reductase test is used as the basis for the former.

Other work was dealt with: anaerobic organisms of milk and butter; influence of heating of tubercle bacilli in whey (in view of a projected means of compulsory pasteurization of waste dairy products); biology of the tubercle bacilli, especially with regard to the part they play in the ripening of cheeses; influence of different methods of pasteurization on the micro-organisms of milk; bacteria of slimy milk.

These researches are often not confined to the bacteriological laboratory, but are also made in various dairies, so as to bring them under the conditions of practice.

Besides this work, of which the results have been published in the Bulletin of the Central Institute, as well as in various scientific journals in Denmark, a great number of bacteriological analyses have been made free of charge on samples of milk, butter, cheese, water used in dairies, etc., sent in by private persons. Consultations on questions of agricultural microbiology are also given free.

Organization of Field Experiments in Denmark

by

H. C. LARSEN,

Secretary of the State Commission for Field Crops at Copenhagen.

Experiments on crops have been carried on in Denmark since the middle of the nineteenth century. When the *Royal Agricultural and Veterinary College* ("Den Kgl. Veterinær og Landbohøjskole") was founded about the year 1829, 25 acres of the land belonging to it were set apart as an experimental field; on this experiments were begun on a plan similar to that of Rothamsted Experimental Station. These experiments went on for more than thirty years. From 1882 to 1903, a Commission nominated by the *Royal Agricultural Society* ("Det Kgl. Danske Landhusholdningsselskab") carried on extensive experiments on cereals, particularly wheat and barley; these were made in various parts of the country and were aimed at determining: the varieties best suited to the climatic conditions of the country, best date for sowing, amount of seed, time of harvest, method of resting, etc. In 1894 *Local Agricultural Societies* began experiments on the land of their members, practical farmers; this work has extended so that each year more than 2000 experiments are made, under the auspices of about 120 societies in all parts of the country. The results of

these experiments are generally only of local value, and indeed are only applicable to the field in question; in the earlier years they were mostly concerned with the use of chemical manures and the manure requirements of the soils; later they were extended to almost all points of field practice. By statistical elaboration of the mass of material for a year's experiments, the results have been made useful in various branches of agriculture in a way that was not previously possible.

The *Government crop experiments* ("Statens Førsøgsvirksomhed i Plankultur") were begun after 1870 by P. NIELSEN, State consulting specialist, under the auspices of our Royal Agricultural Society. They are essentially based on *fixed field experiments*, whose results, separately or combined, can be considered of value for the whole country, or at any rate for the large areas. This branch was made into an independent State institution in 1886 by the establishment of an experimental station at Tystofte.

The following *permanent Government crop experiment stations* now exist:

1. *Tylstrup*, in northern Jutland (Vendsyssel); established in 1886; area — 91 acres of sandy soil, 91 acres of fen (*Carex* moor), 128 acres of peatmoor (*Sphagnum* moor).
2. *Sludsgaard*, in central Jutland; established in 1906; area — 37 acres of light sandy soil ("grass heath"), 37 acres of sandy soil at Bredbo (western Jutland), 27 acres of fen, 54 acres of peatmoor near Høne (western Jutland).
3. *Askov*, in southern Jutland; established in 1886; area — 57 acres of clay, 17 acres of sandy soil, 15 acres of peatmoor.
4. *Aarslev*, in Fünen; established in 1905; area — 82 acres of sandy soil.
5. *Lyngby*, in north-east Zealand; established in 1890; area — 82 acres of clay.
6. *Tystofte*, in south-west Zealand; established in 1886; area — 82 acres of clay.

The *sub-stations* are as follows: *Abed*, in Laaland (5 acres of good clay) and *Aakirkeby*, in the island of Bornholm (7 ½ acres of heavy clay).

Temporary experiments, made on a fairly large scale, comprise: growing of root crops, diseases of plants and their control.

With these experiments are combined chemical, botanical and biological researches, carried out in the *State Field-crop Laboratory* ("Statens Planteavlslaboratorium") at Copenhagen, as well as in the chemical laboratories of the permanent stations.

The *Danish Seed Control* ("Statsanstalten Førekontrol") was established by the State in 1871; this institution assists in the experiment by controlling the seed used in the trials.

In the *State experiments*, the method to be followed is fixed especially with regard to the *position of the stations* and the nature of their land. As mentioned above, three of the six permanent stations are in Jutland, three in the large islands, while the smaller islands have two sub-stations. The country is thus divided into naturally bounded districts, in which the soil and climate are in agreement with those of the station; in each district the land for the experiments has been chosen to have soils as far as possible for the regions under consideration (clay or sand, fen or

the results of the experiments carried out at each station depend essentially on the soil and climate, this method guarantees them the greatest possible value for the agriculture of the district; and as they are, owing to their nature, carried out simultaneously at several or all of the stations, the conclusions drawn from them rest on as wide and solid a base as possible. This is particularly important in comparative trials with different varieties of crops and in experiments on seed yield, time and method of sowing, cultivation, rotations, etc.

Before a piece of land is selected for experiments, the conditions and evenness of the soil are very carefully gone into; uniformity is an indispensable condition of land for experiments. Numerous samples of soil and subsoil are taken according to a pre-arranged plan and at definite distances apart; these are judged and submitted to physical and chemical examination. When the experimental ground has been chosen, the whole is given a trial cultivation by the same methods and under the same crop, generally for several years, so as to work out any possible irregularities due to previous cropping; the soil is thus made uniform. At the same time, the uniformity is tested by weighing the produce of plots not larger than those which will eventually be laid down. The large amount of material obtained from these preliminary investigations allows a very exact estimation of the evenness of the land to be obtained, and serves for the arrangement of the experiments, the classification of the soils, and the setting-out of the fields and plots for the different experiments. The management of the plots is also arranged that any differences due to the experiments themselves are equalized before fresh experiments are started.

In Denmark, as elsewhere, the disturbing influence of variations in fertility is further guarded against by arranging a large number of parallel plots, arranged in size, shape and position in such a way that their average fertility may be supposed to be the same as that of the whole field. The number of parallel plots is generally from 6 to 12; for manuring experiments they cover 4 to 2 rods ($\frac{1}{60}$ to $\frac{1}{30}$ acre); for trials of various seeds and crops, 1 rod to 12 sq. yds. ($\frac{1}{60}$ to $\frac{1}{3000}$ acre); for pasture plants, 1 rod to 6 sq. yds. ($\frac{1}{60}$ to $\frac{1}{3000}$ acre). The smaller the resulting figures from an experiment, and the less the evenness of the land, the greater must be the number of parallel plots. With variety-trials the number often reaches 20, and sometimes exceeds 20 (1). The influence of two adjacent plots on each other may be avoided by establishing a sort of protecting belt all round the plot, and weighing only the produce from the part thus enclosed.

The exactness of working may be examined and checked by a calcu-

(1) In working with different varieties of cereals, the seed samples are all taken from the same spot and under similar conditions. In root crops, especially in comparing varieties, the percentage of dry matter is considered as of prime importance; to determine this four average samples are taken from each parallel plot for each variety, each sample consisting of at least fifty roots; all these roots are cut across four or five times to get a pulp for analysis. The dry matter is calculated from the mean of the four analyses.

lation of the probable error on the materials used, and this can be made as well while the experiments are in progress as when it comes to working up the results for publication. But nothing is published till the results admit of no possible doubt. The experiments are carried on for at least five years, and often for a much longer period before the results are considered fit for publication. Experiments on manuring for rotations thus last over two or three courses, making 16 to 24 years. In this way the influence of the different seasons is largely eliminated, in most cases a necessary condition for obtaining reliable results.

The organization and direction of the State activity as regards experiments is under the control of the Ministry of Agriculture. The *permanent Experiment Stations* are organized as ordinary farms as far as the experimental work permits. Each station is under a *director of experiments*; further, two such directors have charge of the temporary experiments. The directors engage the staff and are nominated and dismissed by the Minister of Agriculture on the advice of the *State Commission for Field Crops* ("Statens Planteavlsudvalg"). This Commission acts as intermediary between the Minister and the State activity on field crops; it sits at Copenhagen and is composed of three members nominated respectively (subject to the approval of the Minister) by the Royal Agricultural Society (whose delegate acts as Chairman), by the governors of the Royal Agricultural and Veterinary College and by the Agricultural Societies which cooperate in the work.

The Budget fixes every year a detailed *plan of work* for the State experimental activity, with details for carrying out the experiments and researches proposed; these number over 200 each year. The directors of experiments discuss the experiments to be made with the representatives of the local experimental organization and also with those of other institutions which collaborate in the work; they then together make up a plan of work which is sanctioned by the State Commission after joint discussion and possible revision; after this the directors are solely responsible for carrying them out. A copy of the results is sent in each year to the archives of the Commission and is used for the working out of the results. The directors themselves undertake this work; for each series of experiments a *report* is nominated; when the series is finished he balances the results and draws up his report. This report is agreed to by all the directors and then published by the State Commission in the *Annals of the Production of Field Crops*; this is the organ of the experimental activity, and is edited by the secretary of the State Commission. *Summarized popular reports*, drawn up in the same way, are published as special leaflets and in the newspaper to bring the results of the experiments before farmers; they are distributed free in large numbers in railway stations and agricultural schools, and at meetings, shows, etc. These summaries are also published in the *Annals*.

also give reports and extracts of reports on the local experimental control of Danish seeds, etc. (1). The organization and direction of the local experimental activity is undertaken by the local Agricultural Societies or their federations. The plans are elaborated and directed by *Local Crop Commissions* and are carried out by consulting specialists named by them, or at any rate with the assistance of these. The different Local Commissions in each Province work together, holding a joint meeting once a year; at this meeting a complete report on the results of the experiments made in the province is presented, the problems and plans for the experiments of the coming year are discussed. The four Provinces of Jutland, Fünen, Zealand and Laaland, each have also a Crop Commission nominated by the societies cooperating in the work, with a consulting specialist for the subject. The *Provincial Crop Commissions* direct the joint work of the Local Commissions, collect and publish their reports, and through their consulting specialists organize and direct the experiments and researches of special interest for the province or the country in general. In the case of experiments of general interest the matter is discussed at the annual meetings of the Provincial Commissions and between these and the State Crop Commission, the State directors of experiments, etc. The annual State grants are as follows: for the State experimental activity, about 200 000 crowns (£11 000); for the local experimental activity, 100 000 crowns (£5 500). The latter is allotted on condition that the provinces themselves contribute more than one-half of the total expenses of experiments.

The Possibility of Replacing Stassfurt Potash Salts by Finely Ground Phonolite Leucite, etc.

by

Prof. LEMMERMANN,

Director of the Institute of Research and Bacteriology at the Royal College of Agriculture and of the Experiment Station of Agricultural Chemistry for the Province of Brandenburg.

CONSUMPTION AND EXPORTATION OF STASSFURT POTASH SALTS.

Before examining the question of the possibility of replacing the Stassfurt potash salts by other minerals it is necessary to know what quantities of these salts are produced and consumed.

Subscriptions for the *Annals* may be sent to the "Gyldendal'ske Boghandel", Copenhagen; the price for one volume (yearly) is 6 crowns (6s 7d).

The total production of potash salts (crude) in Germany was (1):

In 1910	8 031 838 tons
In 1911	9 553 144 "

The manufacture of concentrated salts from the crude material during the same years and in the same country was as follows (2):

Year	Chloride of potash	Sulphate of potash	Sulph. of potash and magnesia calcinated 48 %	Potash salts for manure	Sulph. of potash and magnesia 40 %	Kieserit in blocks	Other products
	tons	tons	tons	tons	tons	tons	tons
1910	427 382	91 735	40 873	516 581	105	29 382	7
1911	436 352	108 383	48 239	635 522	141	29 700	7

The quantities used in Germany for agricultural purposes were following (2):

Year	Crude salts	Containing pure potash	Manufactured products	Containing pure potash	Total	
					Salts	Pro
	tons	tons	tons	tons	tons	tons
1910	1 923 623	249 646	261 176	104 012	2 184 800	338 6
1911	2 168 335	285 294	324 739	130 374	2 493 074	415 6

The quantities of crude salts exported amounted to (2):

In 1910	1.16 million tons
In 1911	1.13

The greatest quantity (709 600 tons in 1910 and 631 900 tons in 1911) was exported to the United States. Next in importance are the Netherlands with 140 700 tons, followed by Russia with 67 000 tons.

(1) According to Dr. M. HOFFMANN: *Arbeiten der Deutschen Landwirtschafts Gesellschaft* 1910, Part 216.

(2) According to Dr. Hoffmann: *loc. cit.*

The quantities of chloride of potash exported were (1):

In 1910	466 000 tons
In 1911	325 000 "

The chief importing countries were:

	In 1910	In 1911
United States	177 000	219 500
France	34 400	39 100
England	14 600	13 900
Spain	8 600	11 700

The exports of sulphate of potash were (2):

In 1910	74 800 tons
In 1911	108 000 "

The following quantities were shipped:

	In 1910 — tons	In 1911 — tons
To the United States	39 070	56 100
" France	8 560	14 860
" Spain	3 250	5 610
" Ceylon	2 230	3 710
" Japan	414	1 480
" Algiers	1 052	1 820

The amounts of sulphate of potash and magnesia exported in 1911
2) 278 500 tons, of which 140 700 tons went to North America,
tons to the Netherlands and 31 500 tons to Sweden.

The table on the next page shows the quantities of potash consumed
whole world (3):

From the above statistics it will be seen that very considerable quantities of Stassfurt salts are used and that their consumption is on the increase. Besides the so-called Stassfurt salts which contain potash in a soluble form (KCl or K_2SO_4) and which hitherto have been found and worked in quantities only in Germany, other minerals containing potash are to be found in considerable masses in other parts of the globe. Such are the silicates containing potash: phonolite, leucite, sanidine, muskovite, etc. For a long time past attempts have been made to use these as manures.

According to Dr. GROSSMANN. Die Ernährung der Pflanze. — *Illustr. Halbmönatsschrift* II (1912), No. 6.

According to Grossmann, *loc. cit.*

According to Dr. Hoffmann, *loc. cit.*

Country	Total potash in tons	Consumption in lbs. per ac.
1. Germany	353 835	9.12
2. United States	241 351	1.30
3. Belgium	8 845	4.24
4. Holland	28 934	12.89
5. France	22 482	0.61
6. England	9 778	1.29
7. Scotland	5 804	3.56
8. Ireland	2 754	1.15
9. Austria	11 628	0.73
10. Hungary	1 321	0.06
11. Switzerland	2 733	1.10
12. Italy	5 512	0.36
13. Russia	14 316	0.100
14. Spain	7 232	0.237
15. Portugal	778	0.154
16. Sweden	16 364	4.240
17. Norway	1 733	2.741
18. Denmark	4 298	1.524
19. Finland	966	0.783
20. Other countries	14 282	—

VALUE OF PHONOLITE AS MANURE.

Of late especially, efforts have been directed towards the introduction of phonolite into agricultural use, for it was believed that it could compete with the so-called Stassfurt salts; as quite recently many experiments have been conducted to ascertain the foundation for the above belief it is now possible to give an opinion based on facts as to the real value of this mineral. Phonolite is a leucitophyre and consists chiefly of nesean, sanidine, nepheline, leucite, augite and biotite. It contains an average of 9 to 10 per cent. of total potassium (of which 33 per cent. is soluble in hydrochloric acid).

id, while only traces are soluble in water), 6 to 8 per cent. of sodium, 2 to 3 per cent. of lime and magnesia, 25 per cent. of oxide of iron and alumina and 50 per cent. of silica.

When phonolite meal was placed on the market, a number of papers are published, especially by WERN, with the object of demonstrating the good effects of phonolite. As the cause of their useful action, said to be equal to that of the Stassfurt salts, the easy weathering of the stone was mentioned as rendering potash available in sufficient quantities.

But many control experiments carried out by impartial workers have failed to confirm these favourable results.

When PFEIFFER and his collaborators (1) compared the effects of phonolite with those of sulphate of potash by means of pot experiments in sandy soil, they obtained the following results. The figures refer to the excess of crop over the pots left without potash manures.

		ratio	
By 1 gm. of K_2O as K_2SO_4 :	29.49 gms. of oats	± 2.49	100
" 1.087 " " phonolite :	11.82 " " "	± 2.81	49
" 2 $\frac{1}{2}$ " " K_2SO_4 :	40.33 " " "	± 2.84	100
" 2.174 " " phonolite :	19.75 " " "	± 2.29	49

According to the above the utilization of the potash contained in phonolite was much inferior to that in the sulphate of potash, being as 9.7 to 88.2. Similar results had been already obtained by other experimenters.

Thus WAGNER (2), in pot experiments comparing sulphate of potash with phonolite for rye-grass, found the following quantities of excess crop over the controls without potash :

		On sandy soil ratio	On peaty soil ratio
By 2.5 gm K_2O as K_2SO_4 :	21.9 gm.	100	73.2
" 2.5 " " phonolite :	10.1 " "	46	24.1
" 3 " " K_2SO_4 :	29.3 " "	100	85.6
" 3 " " phonolite :	8.5 " "	29	39.2

The utilization of potash was as 100 : 11 on sandy soil and as 100 : 14 on peaty soil.

SCHNEIDEWIND (3) also found throughout a considerably smaller effect of phonolite in comparison with chloride of potash. The ratio of the

(1) PFEIFFER, BLANCH and FLÜGEL : Die Bedeutung des Phonoliths als Düngemittel. *Mitt. Landes Instit. Breslau*, Vol. VI, Part 2, 1911.

(2) *Deutsche Landw. Presse*, p. 1, 1909.

(3) Versuche über die Wirkung des Kainits 40%iger Kallsalze und Phonolite. — *Arbeiten Deutschen Landwirtschafts Gesellschaft*, 1911, Part 193.

effects of equal quantities of potash given under the forms of chloride of potash and of phonolite were as follows :

	Chloride of potash	Phonolite
Potatoes	100	33.9
Spring wheat	100	34
Mixed clover and grasses	100	20.3

The utilization of the potash contained in the two manures was the following :

	Chloride of potash	Phonolite
Potatoes	100	24.7
Spring wheat	100	4.1
Mixed clover and grasses	100	10.8

Experiments on vegetation carried out by HEINRICH and HONCAM showed that the effects of equal quantities of potash under the form 40 per cent. potash salts and of phonolite were respectively as follows :

	40 % salt	Phonolite
Barley (grain)	100	36
" (straw)	100	36
Peas (grain)	100	31
" (straw)	100	42

The utilization of the potash in the phonolite was with barley 14 cent. and with peas 20 per cent. of that of the 40 per cent. potash salt. These careful experiments show that the potash contained in phonolite undoubtedly a certain action, but that this is notably inferior to that exerted by easily soluble potash salts.

The results obtained by the easily soluble potash salts, contrary to statements of interested parties, are not attained when phonolite is not mixed with the soil but given as a topdressing, as, for instance, was done in Pfeiff experiments. As for the other available trustworthy experiments they not offer data differing to any extent from the preceding ones.

In the open field phonolite does not in any way have the same effect as the Stassfurt salts. This is clearly shown by the experiments made SCHNEIDEWIND (*Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, 11, Part 193), TACKE (*Protokoll der 64 Sitzung der Zentralmoorkommission* 11, and *Illust. Landw. Zeitung* 1910, No. 3), v. FEILITZEN (*Mitt. der Deutschen Landw. Gesellschaft*, 1910, page 145), HILTNER and LANG (*Prakt. Blä f. Pflanzenbau*, 1909, Parts 10 and 11), POPP (*Mitt. der Deutschen Landw. Ges.*, 1909, p. 724), etc. Thus for instance Hiltner and Lang determine that the effect of equal quantities of potash given to oats under the form

(1) Vergleichende Untersuchungen über die Düngerwirkung von 40 % igem Kalisalz & silicat, etc. — *Mitt. der Deutschen Landw. Ges.*, 1910, No. 45.

per cent. potash salts and of phonolite stood in the ratio of 100 : 22 (according to the other fertilizers applied at the same time); when to potatoes the ratio was 100 : 8 to 30 (according to the other fertilizers used at the same time).

Popp found that in an average of three years the effect of Stassfurt stood to those of phonolite as 100 : 26 to 31, and in another experiment lasting four years as 100 : 26 to 28.

It was thus demonstrated that in the open field, as in pots, the utilization of potash when given as phonolite was considerably less than when as Stassfurt salts.

Tacke's field experiments showed that potatoes on sandy soil utilized per cent. of the potash of 40 per cent. potash salts, and only 1.2 per cent. of that of phonolite (ratio 100 : 4.5); he showed further that with moor soil the ratio of utilization was as 100 : 22 and that with loam soil it was as 100 : 24.

In some isolated cases (observed by Popp) the effect of the potash in phonolite was found to be equal, and even superior, to that of the potash in Stassfurt salts. But these results, as well as their opposite in which phonolite either exerted no action at all or was positively injurious, have no value; they are in the most favourable cases quite exceptional and most probably due to chance caused by the imperfection of field manuring experiments.

The conclusion drawn from both pot and field experiments, namely that phonolite has a certain action but that this is inferior to that of Stassfurt salts, agrees with its petrographic mineralogical composition. One of the chief constituents of phonolite, and at the same time the richest in potash, is sanidine, which is decomposed with difficulty: the potash of this mineral is not attacked by hot concentrated hydrochloric acid. Nosean and nepheline are more easily decomposed, but they are poor in potash and rich in soda. Phonolite is more easily decomposed, and weathered than sanidine; thus the potash available for plants would appear to derive from leucite and eline, while the chief potash-bearing mineral, that is sanidine, is hardly considered as a source of potash for vegetation.

From this composition of phonolite it can be further concluded that the easy weathering attributed to it is due to the minerals nosean and eline, which, however, contain but small quantities of potash. The weathering of phonolite, upon which so much stress is laid, can only to a very limited extent cause a rapid action of potash.

VALUE OF FELDSPAR AS MANURE.

For a long time past feldspar has been considered as a possible manure. W. KNOX in his treatise of agricultural chemistry (1868) at page 188 states that it was not unlikely that some day feldspar would be used as a fertilizer.

It was also believed that its potash was easily assimilable by plants; experiments carried out with this mineral have shown that the manurial

effect of the potash-containing feldspars is very slight (1), as the following experiments prove.

HEINRICH and HONCAMP (see foot-note) found that the fertilizing effect of equal quantities of potash given under the forms of 40 per cent. potash of phonolite and of feldspar were as in the following table, in which quantities produced above those of the control plot are given:

	Straw	Ratio	Grain	Ratio
<i>1. Barley</i>				
40 per cent. potash salt	348.2	100	343.8	100
Phonolite	136.2	39	124.8	36
Feldspar	60.2	17	25.2	7
<i>2. Field peas.</i>				
40 per cent. potash salt	204.7	100	94.3	100
Phonolite	85.9	42	29.2	31
Feldspar	27.1	13	10.3	11

As for the utilization of potash, if that, of the 40 per cent. salt be equal to 100, then the utilization of phonolite by barley was = 14 and field peas = 20; while the utilization of feldspar by barley was = 4 and field peas = 7.

This inferior effect of feldspar (orthoclase) compared with the phonolite (leucitophyre) is in harmony with the lower solubility of potash of orthoclase in water containing carbonic acid and in ammonia chloride solution as compared with that of the leucitophyre potash; this has been determined by R. MÜLLER, K. GLINKA, H. STREMMER (2) and others. A series of experiments made under PRIANISHENIKOV's direction

(1) Manuring experiments with feldspar have been conducted, among others, by C. v. FEILITZEN: *Svenske Moorkultur Föreningens Tidskrift*, 1891 (quoted by B. Zedtschrift d. Landw. Kammer f. Schlesien, 1913).

L. F. NILSSON: *Landbruks Akademien Handlningar och Tidskrift*, for 1889 (quoted by Blanck, loc. cit.).

J. SEBELLEN: *Tidskrift för det Norske Landbrug* XIII, 1901, p. 69 (quoted by loc. cit.).

D. PRIANISHENIKOV: *Landw. Versuchsstation*, Vol. 63, 1906, p. 151; Vol. 77, 1912.

R. HEINRICH and F. HONCAMP: *Mitteilungen der Deutschen Landw. Ges.*, 1901 Parts 4

(2) H. STREMMER: Die Verwendung des Leucitophyrs als Kalisilikat. — *Kal., Zeitschrift für Gewinnung der Kalisalse*, 1912, Part 7.

that all the minerals of the feldspar group possess only a very low ash effect, as may be seen from the following figures:

	Without potash	With orthoclase	With microcline	With sanidine	With KCl (normal culture)
.....	5.33	4.56	5.61	4.66	22.96
celite	1.50	2.40	1.95	1.88	14.95
leucite	2.05	2.45	2.65	4.65	13.85

Thus the potash feldspars (orthoclase, sanidine, microcline are the feldspars richest in potash) can compete with the easily soluble Stassfurt salts, still less than the leucitophyres (phonolite).

USE OF FELDSPAR-LIKE MINERALS (LEUCITE, NEPHELINE) AS MANURES.

It is well known that leucite (silicate of potash and alumina) is relatively easily weathered. Owing to the circumstance that leucitic rocks found in considerable quantities in Italy, the question of using leucite for manurial purposes has been investigated for some years past in that country (1). MONACO (2) has used for this purpose the fairly decomposed leucite, containing leucite, of Orchi on the volcano of Roccamonfina; he examined its solubility in various substances but did not obtain any favourable results.

The manurial experiments directed by PRIANISHENIKOV (3) with leucite confirmed the above results and shown the not very satisfactory effect of leucite as a source of potash, as may be seen from the following figures:

(1) It may here be mentioned that in Italy leucitic basalt has been worked for leucite by separating the non-magnetic minerals, leucite and potash-mica (feldspar) from the magnetic silicates of iron and the basaltic magma, by means of magnets. The non-magnetic product contains an average of 30 per cent of leucite. The cost of preparation is about 17 shillings per ton (cf. LANGHE, Leucite ein Rohstoff für Kali- und Aluminiumdarstellung: *(Zeitschrift für prakt. Geologie)*, p. 80, quoted by Stremme, *loc. cit.*). Recently in Italy this method of obtaining leucite has raised interest.

(2) E. MONACO: Sull'impiego delle rocce leucitiche nella concimazione. *Le stazioni sperimentali agrarie italiane*, Part 7, pp. 577-583 (Modena, 1903). Cf. Stremme, *loc. cit.*

(3) PRIANISHENIKOV: *Landw. Versuchsstation.*, Vols. 63 and 77.

Crop	Without potash	With leucite	With KCl
Millet I.	3.12	3.25	29.24
Oats	4.78	4.81	12.15
Wheat	2.75	4.05	6.40
Millet II.	4.5	8.27	48.68

According to Prianishnikov, nepheline gave better results than leucite. As on the shores of the White Sea there are great masses of this mine which, provided there were cheap means of transport, could perhaps be used in agriculture, PRIANISHNIKOV, at M. Fedorov's recommendation, came to experiments to be made with this mineral. The following results were obtained:

Crop	Without potash	With nepheline	With KCl
Buckwheat	1.70	17.60	17.60
Millet	3.70	23.50	34.95

According to these experiments and others made by Prianishnikov and his pupils, some of which, however, have to be accepted with some reserve, it appears that nepheline is capable of yielding good results as a source of potash. Further experiments on the action of leucite and of nepheline are desirable to clear up the question finally.

According to Prianishnikov's data the chief mass of the nepheline mineral consists of nepheline, biotite and apatite; further experiments may show that the good effects of nepheline mineral are due principally to its content of nepheline (elaeolite) but to the biotite it contains.

(4) E. BLANCK: *Journal für Landwirtschaft*, 1912, p. 97.

Though the above order is not perhaps based on thoroughly reliable experiments, yet in the main it is correct and shows that the feldspar richest in potash are the worst sources of potash, for, as is well known, the decomposition of feldspar diminishes inversely with its potash content.

In the above considerations I have not taken into account the condition of price, as a general comparison can not be made.

COMPARISON OF THE PRICES OF POTASH IN PHONOLITE AND IN STASSFURT SALTS.

Such a comparison can only be made with some degree of precision in the case of phonolite, as this mineral is already on the market as a potash manure.

The prices of one pound of potash in the forms of kainit, 40 per cent Stassfurt salts and phonolite are as follows:

Part of Germany	Kainit — pence	40 % salt — pence	Phonolite — pence
West: Cologne, 1910 (1) :	0.889	0.940	0.801
Centre: Bernburg, 1911 (2)	0.534	0.828	1.394
„ Giessen „ „	0.700	0.876	1.031
North: Oldenburg, 1912 (3)	0.892	0.935	1.260
East: Danzig, 1913 (4)	—	0.908	2.403

Thus it is only in the immediate vicinity of the place of production that phonolite can compete with the Stassfurt salts. But even there, if the material effect of the mineral be considered, its use does not seem to be profitable.

EXPERIMENTS WITH THE OBJECT OF IMPROVING THE ACTION OF THE MINERALS.

Attempts have been made to improve the effect of the ground mine by simply mixing it with certain other fertilizers. Ferd. Schack of Cologne has taken out a patent for the following process:

- (1) According to REMY: *Ill. landw. Ztg.*, 1910, No. 677.
- (2) „ „ KRÜGER: *Mitt. der Versuchsstation Bernburg*, No. 48, 1911.
- (3) „ „ POPP: *Oldenburg Landwirtschaftsbl.*, 1912.
- (4) „ „ GERLACH: *Landw. Centralblatt für die Provinz Posen*, 1913, No. 3.1
perhaps no wholesale price was taken as the basis of the price of phonolite

process for the preparation of manures composed of recent eruptive rocks containing potash and combinations of lime. The quantity of such, or in combination as cyanamide, nitrate of lime, carbonate of gypsum, to be mixed with the finely ground, unroasted mineral in such quantity to provide the molecular equivalent of the bases contained in the mineral.

By means of the exchange of bases the potash contained in the eruptive rocks is calculated to form combinations assimilable by plants.

JEFFER, BLANCK and FRÜGEL (1) have examined the above process by means of careful experiments, and have ascertained that the effect of the process on phonolite is in no wise improved by it.

By experiments of Prianishnikov have shown that the not easily soluble potash of feldspar is not rendered more assimilable by mixing with logically acid fertilizers such as sulphate of ammonia, which on the contrary increase the solubility of the hardly soluble phosphoric acid of phosphates. This agrees with the fact that neither phonolite nor feldspar has a better effect on acid moor soils than on other land.

CHEMICAL TREATMENT OF SILICATES OF POTASH.

In several countries many attempts have been made to render the potash contained in several minerals, and especially feldspar, more soluble by industrial processes. With this object in view several patents have been granted in America for processes which consist essentially in roasting the potash mineral with lime, or its carbonate or chloride, or common salt. This process is, however, too expensive and it is now sought to obtain potash as a by-product in the manufacture of cement. The question is fully reported in this *Bulletin* (2).

Similarly in Sweden, as well as in Germany, the treatment of feldspar has been tried. Sulphuric acid and electricity have been applied but hitherto without any decisive result (3).

In conclusion we may subscribe to the opinion of the Swedish agriculturist F. VON FELLITZEN, who says: "Even if the above attempts represent an increase of our knowledge on the hardly accessible source of potash in feldspar as a means of emancipating our agriculture from foreign fertilizers, we are still a long way from the solution of this important problem; until we reach it we can be satisfied that in the German potash fields we possess an excellent, quick-acting and not too expensive manure".

1. *ibid.*

2. No. 1613, *B.* Dec. 1912.

3. America's great hopes were founded on the treatment of seaweed, from which in reality small quantities of potash can be extracted. Nevertheless a factory recently erected in California has already given up treating seaweed as unprofitable.

The Present State of Olive Growing in Italy

by

Prof. F. BRACCI,

Director of the Royal Experimental Station for Oil-making, Spoleto.

From the most remote antiquity the cultivation of the olive has been very important in Italy.

The special conformation of the country, its position in the basin of the Mediterranean, that is in the centre of the habitat of the olive, the mildness of its climate and the fertility of its soil, render the peninsula favourable to the growth and production of this oil plant. It is not certain whether Italy or Spain occupies the first place for extent of area under olives and for quantity of oil produced. Whilst the Spanish statistics are liable to discussion, in Italy at present a different system is followed in the valuation of the area under olives, a distinction being made between the area devoted exclusively to olive trees and the area which these trees share with other crops. Thus comparison between the two countries is not possible at least as regards the areas.

The statistics made before the introduction of the new system give the following figures for the acreage under olives :

				acres
Average between 1870 and 1874				2 210 650
"	"	1879	" 1883	2 294 630
"	"	1890	" 1895	2 663 538
"	"	1901	" 1908	2 705 428

With the new system the figures are:

		Average between 1909 and 1912	acres
Olive trees intermingled with other crops			4 338 5
Olive trees alone			2 353 5

Considering the figures according to the new system to be correct, it appears that the area estimated at 2 705 428 acres was in reality 34 acres less.

Though we may not infer that the area occupied by the olive has increased from 2 210 650 acres in 1870 to the present 3 423 420 acres, as the figure may be, and probably is, due to greater accuracy or at any rate to a different method of estimating the area, there are in reality grounds for believing that the area under olive trees has sensibly gained in extent as a fair number of new plantations are to be seen, mostly better situated than the older ones. There was, however, a short period after 1880 when

in which many olive groves were destroyed to make way for vineyards; this took place especially in Sicily and Calabria.

As for the yield, statistics point to a constant decrease from 1870 to the present time.

Taking into consideration large averages we get, up to 1908, that is, to the new statistics, the following figures for olive oil:

	gallons
Period between 1870 and 1883	73 843 000
" " 1885 " 1896	53 663 500
" " 1897 " 1908	45 988 800

According to recent statistics the average from 1909 to 1912 was 282 000 gals.; but perhaps 50 025 800 gals. would be nearer the mark, as it would include the residual oil (including "olio lavato", extracted from pomace by washing; "olio d'inferno", collected from the well under the presses; and that obtained by treatment with carbon disulphide). (1). For comparison, with the returns of the older statistics the figure of 43 956 000 gals. should be taken, as it includes only the "inferno" oil. It confirms the decreased yield of the olive tree.

The causes of the decrease of production and of the critical state of this crop during the last thirty years are many and of various kinds, namely: weather conditions, parasites, and constitutional and cultural conditions.

Reviewing notes on the oil crop since 1889; it appears that during these 5 years *drought* and *scirocco* caused more or less injury in 21 cases; *winter frosts* and *cold springs*, and *mists* and *rain* that injured the flowering, in 7 cases; the *olive fly* caused serious and general injury in 10 cases; lesser or partial damage, together with *Rhynchites* and *Phlaeothrips* and other insects in 7 cases; *Cycloconium* caused partial injury from the year 1902 onwards and since 1910 with increasing gravity and in almost all the growing districts. From the above it is seen that the most efficient cause of injury is the almost constant *drought*, which is easy to understand if one remembers that the olive tree grows mostly on hills and mountain slopes and most frequently without the necessary work being done to retain the rainwater, while the

(1) Whilst in the old statistics the quantity of oil was ascertained directly from that obtained during the season in each commune, with the new system the quantity of olives recorded and the quantity of oil is calculated according to the average yield in the mill of the various districts. This yield does not include the "inferno" oil, nor that obtained by washing or treating with carbon disulphide, though these oils also are put upon the market; the first of these oils is used to a great extent as food by the poor, who often prefer it to the better oils; it is also used, as well as that obtained by washing and by treatment with disulphide, in the industries. The "inferno" oil may be calculated at about 1 per cent. and the other two oils at 2.5 per cent. of the crushed olives.

olive tree requires a good deal of moisture, which, as Giglioli (1) says, is the manure *par excellence* of the olive tree, especially during the growth of its fruit. Next in order of importance come the serious attacks of the olive fly and other animal or plant parasites, the development and spread of which are to a great extent dependent upon the abnormal physiological and cultural condition of the trees which we shall briefly consider.

In the first place let us examine how the olive is cultivated in the various regions of Italy (2) (see Table I).

TABLE I.

Region	Intermingled culture acres	Specialised Culture acres	Total — acres
Piedmont	—	—	—
Liguria	62 738	88 426	151 164
Lombardy	9 139	3 705	12 844
Venetia	2 717	4 693	7 410
Emilia	16 549	—	16 549
Tuscany	685 919	26 182	712 101
Marches	425 581	—	425 581
Umbria	141 778	17 043	158 821
Lazio	126 711	40 508	167 219
Abruzzi and Molise	657 514	4 940	662 454
Campania	446 082	106 210	552 292
Apulia	545 376	712 101	1 257 477
Basilicata	42 484	40 014	82 498
Calabria	491 530	141 284	632 814
Sicily	696 787	117 078	813 865
Sardinia	7 657	51 376	59 033
Total . . .	4 358 562	1 353 560	5 712 122

(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: Di alcune condizioni che influiscono sull'efficacia dei concimi chimici, Rome, 1903.

(2) MINISTERO DI AGRICOLTURA, INDUSTRIA E COMMERCIO. — UFFICIO STATISTICA AGRARIA. Prospetti riassuntivi dei XX prodotti rilevati nel quadriennio 1909-1912, 12, June 1913.

the above table shows the olive tree is grown in all the regions of Italy, save in Piedmont, but two thirds of the olive groves are in the south peninsula, the provinces of Apulia, Sicily and Calabria occupying in respect the foremost positions.

Usually three-quarters of the olive groves are under intermingled crops, they contain besides olive trees other plants, most frequently cereals (wheat and maize) which are grown up to the very trunks of the trees; of the groves consist of old irregularly arranged trees, often in rows straight down hill on very steep soils, or without sufficient protection to the surface water which lays their roots bare. In those groves (the older ones) formed exclusively of olive trees, they are often too close together so that the crowns in their struggle for light and air grow to great height; as much as 33 to 48 feet; this may be seen in Calabria, Apulia and in some parts of Tuscany.

The number of different varieties scattered at random in the groves is considerable; there is also much confusion in their names; nevertheless the number of the prevailing varieties grown for oil in each region is relatively small. The following may be noted as being the most frequently met with and the richest in oil:

in Liguria: *Taggiasco*.

in Tuscany: *Razzo* or *Frantoiano*, *Moraiolo* or *Morinello*, and *Leccino*.

in Umbria and the Marches: *Raio* or *Razzo*, *Moraiolo*, and *Carbonella*.

in Latium: *Carbognola* or *Marsella*, and *Verniera*.

in the Abruzzi: *Nordana*, *Gentile* and *Olivone*.

in Apulia: *Paesana* or *Baresana*, *Coratina*, *Monopolese*, and *Ogliarola*.

in Calabria: *Ottobratica*, *Coccitanica*, *Mammolese*, *Nicastrese*, *Cumiana*, and *Roggianese*.

in Terra di Lavoro and Molise: *Aurina* and *Ciazzana*.

in Lombardy and Venetia: *Casaliva* or *Nostrana*, and *Drop* or *Tombolet*.

in Sicily: *Ogliaria*, *Calamignara*, and *Cerasola*.

in Sardinia: *Maiorchina* and *Genovese*.

In general, among the above-mentioned varieties that give the most delicate fruit, there are others called *Olivastri*, *Olivastroni* or *Olivastrelli*, as they are hardier, more resistant and more constant in bearing fruit than the preceding varieties, but their fruit does not contain so much oil and is as delicate. These latter varieties deserve greater consideration on account of the exhaustion and low productiveness of the other varieties due to their having been multiplied vegetatively during centuries and to their resistance to unfavourable conditions.

In fact for centuries the olive trees have been multiplied by means of the *puppoli*, as the egg-shaped buds which are formed at the base of the stem are called in Tuscany, Umbria, Latium and Reggio Calabria, in which regions this method of multiplication is used. In the Marches, the Abruzzi, Catanzaro, Cosenza and Sicily cuttings (*talee*) are used, in Liguria, Lombardy, Venetia, Latium and some parts of Sicily the *polloni* that grow at the foot of the tree (*polloni*) are preferred. Less frequent is the use of wild olive trees, as in the districts of Lecce, Capitanata

Grosseto and Sardinia, and still more rarely recourse is had to plants obtained by sowing the olive stones. The result of the above vegetative method has been to perpetuate the defects of the mother plants, such as canker, and resistance to frosts, drought and parasites. To the harm caused by the original defects, the injury caused by neglect or unsuitable pruning, manuring, tillage of the soil and control of parasites is frequently added.

As for pruning, while the necessity of practising it at short intervals, possibly every year or at least every two is being gradually recognized, the custom of pruning every three or four years is still very prevalent. There are some important oil-producing districts, especially in the south, where as many as seven or eight and even ten years elapse between pruning and the next (1).

In Italy there are some centres in which capable pruners are found; they are much esteemed and sought for abroad (Dalmatia, Istria, Greece). There are also schools which prepare pruners by means of practical courses. A wider diffusion of the sound principles of olive pruning would be desirable, because in several regions nothing could be more capricious, superstitious and ignorant than the way in which this, the most delicate of horticultural operations and intimately connected not only with the productivity of the tree but with its vegetation and resistance to disease, is carried out. Some think that they must cut blindly, topping and even pollarding the tree; others treat the olive like the mulberry; others, again, scarcely prune the tree, notwithstanding the length of time that is allowed between successive prunings, for fear of removing too much foliage (parts of Calabria, of Sicily, of Tuscany, of Liguria). Some lop off a main branch every year leaving the rest untouched, with the idea of thus rejuvenating the tree (!) while in reality they favour the spread of canker (Umbria). Other pruners train the main branches nearly horizontally, hollow out the crown and cause the tree to produce a number of low hanging branches reaching almost to the ground (Bari, Potenza and Florence districts, part of Umbria, etc.), while others keep the whole framework of the tree almost vertical, remove all the lower branches or allow the tree to grow naturally, in each case considering the special conditions of the tree nor the requirements of the variety, etc.

As for manures there are districts where little or no manuring is given, some in which manures are given once every three or four years, others in which the olive tree is frequently and well manured. In general farmyard manures (from horse stables and cattle and sheep sheds) are given; sometimes pure sheep or goat dung or night soil is used. The animals are often run in the olive groves for the sake of their droppings; less frequently woollen rags, leather waste, hoof and shavings, fish residues, silkworm chrysalides, olive pomace and the

(1) SOCIETÀ DEGLI AGRICOLTORI ITALIANI: *L'olivo e l'olio in Italia*, Monograph presented at the International Exhibition in Paris, 1900.

IDEM: *inchiesta eseguita sulla propagazione e coltivazione dell'olivo*, 1912.

plied as manure. Mineral substances, such as builders' waste, ashes, a limited extent chemical manures, or vegetable matter, either pre-rotted or not, such as seaweeds, swamp grasses, leaves of forest trees, pine needles, etc., are given. Lastly leguminous green manures, beans, vetches, etc.) (1) are used, but only to a very limited extent. The olive trees grown together with other crops get the best treatment as they profit by the manure given to the latter.

As for tillage, in general little is done: the ground is hoed or ploughed with a primitive implement at long intervals, generally once a year, once at the utmost, and this while drought is one of the weather conditions that has the most depressing effects upon the yield.

As for the diseases that attack olive trees there are a number of them: bacterial tumours, root-rot, olive fly, weevils, scale insects, *Psylla Rhynchites*, *Phlaeothrips*, fumago, *Cycloconium*. *Silicis Panizzei*, are leaf diseases which have always with more or less virulence attacked olive trees already apparently suffering from senility. There is no doubt that the most injurious pests are *Phlaeothrips* and *Cycloconium*. After especially, both of them destroying the foliage of great numbers of olive groves. *Cycloconium* is all the more dangerous inasmuch as through the ignorance of the great mass of olive growers its action is especially insidious. The farmer notices an unusual fall of the leaf, usually in spring, and gets alarmed. But soon, new leaves appear, the olive becomes again green and the farmer is reassured, especially when he sees a good amount of bloom showing, which is the case if the disease is not far advanced. But meanwhile the flowers and the young fruit fall, the oil is nil, and by the end of the succeeding winter or in spring the leaves fall again and more plentifully. The olive grower gets discouraged and abandons the olive trees to themselves, depriving them even of the scanty care then bestowed upon them. This happens now in a great part of Italy and it is urgent to have recourse to the more or less perfect remedies now known: that is to spraying with salts of copper in order to prevent germination of the conidia of the fungus, and to the intensive culture of olive trees as indirect means of increasing its vigour and resistance to diseases.

Unfortunately for Italy, by the side of the old unproductive and perishable olive groves there are others either recently planted or restored to which are carefully tended, pruned, manured and systematically treated against diseases; these show clearly that no fear need be entertained of the extinction of olive cultivation, but on the contrary demonstrate its utility, especially on hill slopes where no other culture would be possible or advantageous. And if the results of experiments recently conducted in various parts of Italy on the improvement, management

See pamphlets already quoted: CONFOCAZIONE DEI COMIZI AGRARI ITALIANI, *Sulla nuova chimica e con i suoi effetti delle olive e degli ulivi. Ricerche d'inchiesta in Italia.* — RO GUAGLIOTTI, relatore. Terni, 1912.

and manuring of olive groves become widely known and lead to the lowering measures being adopted, there is no doubt the olive in Italy soon resume its place among the most paying crops.

The most important measures for the improvement of the olive groves are: thinning out of those that are too crowded, thus freely admitting sun, a great enemy of most parasites; gradually and systematically pruning the trees so as to oblige those that have grown too tall to throw out branches nearer to the ground; replacing the old decaying trees by seedlings that have been grafted to the varieties most suitable to the various localities and which can now be easily prepared in every farm or can be brought from the best nurserymen of Tuscany (Pescia, Pistoia, Florence) and other parts of the country; a suitable arrangement of the steep slopes and the use of the hoe or the plough together with green manuring so as to keep the necessary moisture in the soil during the summer; returning to the soil the necessary fertilizers, particularly those containing phosphoric acid and potash (and lime in some cases), and lastly spraying with mixtures containing copper against *Cycloconium*, which operation is rendered easier by thinning out and lowering of the crowns of the trees, and using even other treatments to control other pests.

The Recent Development of Cattle Breeding in Sweden

by

Dr. E. O. ARENANDER,

Professor at the Agricultural College at Uppsala, Sweden.

I. — INCREASE IN THE NUMBERS OF LIVE STOCK.

The northern position of Sweden makes it naturally more suitable for the rearing of live stock, particularly cattle, than for grain growing; the culture is all the more pronounced in the north, and Norrland produces a very small proportion of the grain required by its inhabitants.

The live stock of the country consists of horses, cattle, sheep, pigs, poultry and reindeer, the latter belonging to the nomad Lapps in the high north. The numbers at the end of 1911 were as follows:

Horses under three years	493 322	
Horses over three years	95 165	
		588 487
Cattle		
Steers	144 277	
Bulls	52 467	
Cows	1 837 035	
Young stock	655 830	
		2 689 609
Sheep		945 709
Goats		66 135
Pigs		951 164
Poultry		3 961 141
Reindeers		276 084

If the various classes of stock (horses, cattle, sheep, goats and pigs) are calculated as cattle units (1), we get the figures shown in Table I as indicating the increase in the numbers of live stock in Sweden in the last half century.

TABLE I.

Year	Cattle Units	Per 1000 inhabitants	Per 1000 acres of area	
			total	of arable and permanent grass
1865	2 591 037	630	26	245
1875	2 863 006	653	28	247
1885	3 093 955	661	30	252
1895	3 367 999	685	33	272
1905	3 406 961	643	33	265
1911	3 617 472	655	35	291

Thus the live stock population has steadily increased; but since 1895 the increase of the human population has been more rapid than it. The fact that the number of cattle units per area of land has steadily increased through this period would lead one to expect a similar increase in the area under green crops, and the agricultural statistics show that this is the case. This increase has been especially in root crops for feeding, but the yield of hay on the temporary grassland has also increased considerably.

Sugar beet growing hardly existed 25 years ago; by 1890 the yield was 10 700 tons and in 1911 it had risen to 950 300 tons. The crop of roots for feeding (mangels, carrots, turnips and swedes) increased from 3 235 000 bushels in 1865 to 98 351 000 bu. in 1911. In 1890 the crop of hay from temporary leys was 2 $\frac{1}{4}$ million tons, but lately it has exceeded 4 $\frac{1}{4}$ million. Green crops have also extended considerably, especially in the north, but there are no statistics for them. Further, the increase in grain crops has meant more straw available for feeding.

By means of this increase of fodder resources it has been possible to bring up the stock of animals; the development has been greatest with cattle and pigs, both in quantity and quality. The numbers of the horned stock of different types are shown in Table II.

(1) One cattle unit = 2/3 horse, 1 beast, 8 sheep, 12 goats or 4 pigs, two young animals of any class are equal to one adult of the same class.

TABLE II.

Year	Steers	Bulls	Cows	Young stock	Total
1865	282 844	38 791	1 185 556	417 163	1 924 354
1870	269 762	38 674	1 231 477	426 014	1 965 927
1880	289 071	47 985	1 409 236	481 465	2 227 757
1890	253 735	49 066	1 578 927	517 763	2 399 491
1900	218 932	51 390	1 764 819	547 414	2 582 555
1905	184 328	49 444	1 763 857	552 299	2 549 928
1910	152 925	54 793	1 861 219	678 679	2 747 516
1911	144 277	52 467	1 837 035	655 830	2 689 569

Only the steers have shown a permanent falling off in numbers; they are kept in Sweden only for work, this is due to the increase in the wages of labour, which has made horses more economical owing to the quicker going. The fact that the number of bulls has not increased as rapidly as that of cows, or has even decreased in some years, is probably the result of the extension of cooperative bull societies, which has meant considerable economy in the number required. Except for a slight relapse in 1910 caused by shortage of crops, the cows and young stock have shown a large and steady rise in numbers, reaching over 55 per cent. in the period.

For a just appreciation of the enhanced value of the horned stock more attention must, however, be given to the improvement in quality which has greatly exceeded the numerical increase.

II. — IMPROVEMENT OF THE BREEDS.

When towards 1840, general interest began to be aroused in Sweden in the improvement of the cattle, the prevalent opinion was that the indigenous breeds were so inferior that the only way to improve them was by crossing with well-known breeds from other countries. A number of herds of various breeds were imported to find which would be the best for the purpose. The only two breeds which gained the confidence of farmers were the East Friesian (from Holland and Ostfriesland), and the Ayrshire; these breeds have become so widely spread and have been so largely used for crossing that the indigenous breeds have almost entirely disappeared in the southern and central parts of the country, the introduced breeds have taken their place either pure or as crosses. A reaction against this excessive importation began towards the

century. The two introduced breeds had developed so well that it no longer seemed necessary to depend on continued importation, which was uncertain for the breeder; little by little importation has become less important, and rational selection of the breeding stock has led to such a development of national breeding that Swedish East Friesians and Ayrshires can compete with the animals in their original homes; recently of both breeds has been exported at very good prices.

Besides this, some more or less wholly indigenous races have been developed. In Central Sweden there were a number of gentlemen's herds bred from the native red or yellow cattle, but containing a good deal of Scotch, Shorthorn and Ayrshire blood; they combined a good milk yield with considerable weight and early maturity. The owners of these herds tried to form a uniform breed without using imported animals, and their efforts have been so successful that the race thus evolved, the Red Spotted Swedish, has now been recognized as a pure breed. They are most like Ayrshires, but make better butcher's beasts than these.

While the above-mentioned breeds have done well in the more fertile parts of central and southern Sweden, the same cannot be said of the northern country, where feeding is much more scanty and the beasts have to find their food in the forest in summer. In these parts, the indigenous cattle, white or spotted on a white ground, was retained; this breed, known as the Fjäll, gave little in the way of milk or meat, but was accustomed to unfavourable natural conditions. It was generally believed that the low production was a direct result of the conditions of life, and that a better was to be expected. All the same, a beginning was made thirty years ago at attempts to improve the breed by better feeding and selection of the best milking strains. The result of these efforts is that there are now a number of small herds which give an average yield of 6000 and more of milk a year, a very satisfactory amount in consideration of the low live weight; this, though increased a good deal, hardly exceeds the average for cows.

The uncertainty as to choice of breeds has now ended, and each district has been bred on one or more of the four breeds mentioned: 1) East Friesian, in the fertile districts; 2) and 3) Ayrshire and Red Spotted Swedish, where conditions are not quite so favourable; and 4) Fjäll, where the poor forest pastures have to be used.

Besides the Fjäll there was another polled breed, red in colour, of which few remnants remained scattered in out-of-the-way districts in various parts of the country. In the last few years these have to some extent been collected together to make a pure breed, the Swedish Red Polled cattle, and the results already obtained with some herds look encouraging.

III. — MILK YIELD.

The progress realized in the productivity of the cattle can also be seen from the figures for production of milk and butter and for increase of weight. The official statistics do not give direct information on these

points, but our statisticians have attempted to estimate the figures milk production. Thus M. Gustav Sundbörg works out the average yield per annum as follows:

About 1870	2 600 lbs. per cow
" 1880	3 100 " "
" 1890	3 700 " "
" 1903	4 200 " "

Another author, M. Nils Hansson, an authority on the dairy-farms of the country, has estimated the present milk yield at an average of 2 600 lbs. The three first figures of M. Sundbörg's table are very uncertain, they come from a pure estimation of the production of the different provinces, in which the breeds, feeding and management are very variable. The figure for 1903 is already an improvement, as it is the result of estimation of the mean annual production made in every parish throughout the country. The 1912 figure is still more trustworthy, as it is based on the latest figures from the Dairy Control Societies.

Under these societies, numbering 749 in 1911-12, no less than 11 per cent. of the total number in the country, were submitted to careful control; the results are as follows.

The mean annual yield per cow was 5748 lbs. of milk, with an average fat content of 3.50 per cent., corresponding to 201 lbs. of butter-fat lbs. of butter. As the control herds are among those in which systematic efforts for improvement are made, M. Hansson has deducted 20 per cent. from this yield to get the average for the whole country, giving the figures quoted above.

The great variation of yield in different parts of the country can be seen by parallel figures from the two provinces giving respectively the highest and lowest yield (Table III).

TABLE III.

Province	Average yield		Number of cows under control	
	milk lbs.	butter lbs.	total	per cent. of total
Malmöhus: average	8 087	289.6	46 084	31
highest society	10 392	364.8	324	"
lowest society	6 200	239.3	64	"
Vesterbotten: average. . .	4 388	154.3	2 569	"

On the basis of these figures, the total milk production has been calculated as follows:

1875	about 3100 million lbs
1885	4100 " "
1895	5400 " "
1905	6600 " "
1910	13200 " "

The progress in milk production led to a corresponding development of the dairy industry. Formerly the treatment of milk was a household affair, and it was not till 1865 that the first dairies were started. The earliest ones were established by the owners of large estates to use the milk from their herds; these may be called "*estate dairies*"; but gradually *commercial dairies* came to be started by private persons or companies. They were not connected with any form of farming and treated purchased milk. The great profits which the proprietors of these dairies often made and the difficulties which arose from the lack of interest of the farmers in the quality of the milk sold to the dairy, combined to produce general discontent in this type of dairy; towards 1890 *cooperative dairies* were started; in these the farmers shared according to the amount of milk supplied and the content was soon also taken into consideration.

This type of organisation has proved very advantageous, both as regards better quality of the milk and the products turned out, and in giving better financial results. The consequence is that the cooperative dairies have gained on the estate and commercial ones, as shown by the figures in Table IV.

TABLE IV.

	1890	1900	1905	1910
Total number of dairies . .	1 562	1 793	1 575	1 461
Estate	809	624	399	
Commercial	610	529	536	
Cooperative	73	302	470	
Milk treated lbs.	1 115 784 000	1 856 909 000	2 024 050 000	2 533 590 000
Milk produced "	35 480 000	58 657 000	62 791 000	73 983 000

The diminution in the number of dairies in the last few years is due to the concentration of the industry, consisting in the disappearance of many small competing establishments in favour of larger and better organized ones.

The chief object of the Swedish dairy industry has always been the production of butter; a part of this, increasing up to 1896 has been exported particularly to England, to which country it goes direct or via Denmark.

The total exports for the last fifty years have been in round numbers:

1861-65	355 800 lbs.	1886-90	31 074 000 lbs.
1866-70	248 900 "	1891-95	44 147 000 "
1871-75	6 954 700 "	1896-1900	48 074 000 "
1876-80	9 248 000 "	1901-05	42 718 000 "
1881-85	17 678 000 "	1906-10	40 857 000 "
1912	45 717 000 lbs.		

VI. — BUTCHER'S BEASTS

Before the beginning of the dairy industry and the exportation of butter, attempts had been made to export live cattle to England. The success of this enterprise was not great, owing to the poor quality of the Swedish cattle; but as the increasing interest in milk production gradually led to better feeding and consequent greater body development, the exportation of butcher's beasts became more important, till it was put an end to in 1892 by the prohibition of introduction of live cattle into the British Isles. Efforts to turn the exportation to Germany were also soon frustrated by similar measures in that country, but since the beginning of the new century exportation of live cattle and meat has developed again; it is directed chief to Germany and Switzerland.

TABLE V.

Annual exportation of cattle and meat from Sweden.

Year	Bulls	Steers	Cows	Young stock	Value
1881-85	1 207	30 660			317 400
1886-90	2 489	13 135	15 265	1 981	368 600
1891-95	3 935	5 481	9 300	955	203 650
1896-1900	2 292	1 253	5 265	1 010	103 550
1901-05	3 577	404	7 038	3 558	118 900
1906-10	3 365	563	8 284	4 971	190 950
1911	6 974	6 946	19 711	13 340	566 200

The importation of live cattle and meat into the northern industrial districts, chiefly from Finland, has never been of much importance. In 1911 the value was £. 34 600.

Naturally the better feeding has increased the live weight of the cattle. Statistics do not give any direct evidence on this point, but it can readily be demonstrated from material taken from the reports of the breeding societies. Thus, the normal weight of Ayrshire cows, which are the most widespread in the central and southern provinces, was estimated at 1000 to 1100 lbs. about 1890; at present it averages 1100 lbs. The weight of Friesian cows, which are kept chiefly in the fertile province of Malmöhus, has also increased, and is now reckoned at 1300 lbs. The Red Spotted Swedish cow, developed chiefly by crossing with Ayrshires, occupies an intermediate position between these two breeds as regards live weight of the cows. The same progress can also be observed in the two native polled breeds — the *Blå* (white and spotted), predominating in the north, and the Swedish *Blå* Poll, which is the most southerly branch of the hornless cattle. For the *Blå* breed, the normal weight of the cows was estimated at 660 to 700 lbs. in 1890, and it now reaches 770 to 810 lbs.; the live weight of the *Blå* Polls may reach even 840 or 880 lbs.

V. — ORGANIZATION.

The development in the stock of cattle to which we have drawn attention is naturally the result of the efforts and care of the farmers themselves, but it has been greatly encouraged and facilitated by various measures taken by the authorities carried out at the public expense. The first place should be mentioned the regular shows, with prizes distributed on a uniform system ("Flach System"); these were begun in the province of Skaraborg in 1882, and in 1892 were organized in all the provinces with the help of grants from the Government and the Agricultural Societies; each province forms a prize district. The idea of these shows is to bring to the attention of all animals fit to be used for breeding and to classify them by prizes according to their value for the purpose. For each approved cow, the owner receives a service ticket for each year, giving the right to put the cow to a service bull of the same breed; the owner of the bull is then paid for the tickets at a rate depending on the class in which the bull was placed.

These shows are specially intended to improve the stock of small farmers, and they alone are entitled to prizes and service tickets for cows. But, owing to the sums brought in by the service tickets to the owners of especially good bulls, the Flach system also encourages high-class breeding among the wealthiest farmers.

These shows, which are generally held every other year in a locality, have been very valuable in bringing farmers to recognize the importance of breeding from good stock. Another result has been that in each district one or two breeds have been fixed upon as specially appropriate for the natural and economic conditions of that district.

The shows have continued to increase in number, and at the same time the proportion of the cows approved has become higher. In 1910, 62,671 animals were examined, and 55,917, or 89 per cent., were approved or given prizes. The expenses for the year reached about £18,000.

As we have just shown, the giving of prizes and the money brought in by service tickets may make the keeping of bulls a profitable business. To this circumstance is due the formation of co-operative bull-keeping societies. The provincial agricultural societies encourage these societies by loan without interest for the purchase of bulls and by special prizes at the shows. The formation of these societies has developed at about the same rate as the shows, and there are at present about 1200 of them, distributed throughout all the provinces of the country.

Another measure in connection with the shows has been the establishment of herdbooks for the more important breeds. These have generally been drawn up and published by the provincial agricultural societies soon after the starting of shows on the system described. Registers for certain breeds have also been established by the societies for the improvement of these breeds (Ayrshire and Red Spotted Swedish). Lastly, the Government has undertaken the preparation of herdbooks for one or two breeds; of these, the Ayrshire is the only one yet published, but the Fjäll will appear shortly.

Next to the shows, the Control Societies have contributed most largely to the great progress in live-stock breeding and the improvement of the economic position of stock farmers. The first society of this nature was founded in 1898, and at the end of 1912 the total number was 749, distributed through all the 24 provinces of the kingdom. The largest number, 160, is in the province of Scania, which is the most populous and best cultivated part of the country; but these centres of advancement in the economy of live stock occur right up to the desolate regions of Lapland.

The effects of the regular control organized by these societies have everywhere been seen in the disappearance of the cows that gave the small return for the food consumed and in a more severe selection of the animals to breed from; the consequence is that the average milk yield has shown a more or less rapid rise. In the earlier years this rise was largely due to better feeding; the amount of food per cow, as well as in relation to the milk yield, often rose for a time; but the farmers soon learnt to make up more suitable rations, and the number of fodder units diminished in proportion to the milk produced, and often also absolutely.

By publishing the results obtained yearly for each herd, the control societies very soon made known the productive capacity of the herds as well as of the individuals composing them. From the beginning of the present century, the control figures for the production of milk and butter have been used along with the external points and pedigrees for judging the animals at the great national shows held every five years (last in 1911). But these control figures are not deemed sufficient for judging the breeding value, especially in highly selected strains.

meet the need for more searching examination of the animals for this, which is particularly required in the distribution of the great State or breeding stock, competitions of breeding centres have been established. The herds entered for these competitions are submitted to careful observation for two years; the observations extend to quantity of milk and butter produced and consumption of food for each cow, and uniformity, and vigour for the herd in general. Such competitions have been held twice, in 1903 and 1908, and a third will begin this year. The notion of being classed as a breeding centre has been found to be of such valuable commercial advantage that at present money prizes are not distributed except for herds of the Fjäll breed, which as a rule belong to small farmers.

The direction of the official measures just described is entrusted to committees appointed by the Government and the Provincial Agricultural Societies. But besides these, the breeders have formed societies for the different breeds. The first of these was the Red Spotted Swedish Society, formed in 1899; the Swedish Ayrshire Society was founded for the development and consolidation of the various strains of Ayrshires occurring here over a large area, and of very varying types. These two societies organized the registering of animals descended from those entered in the Ayrshire Cattle Herd Book and given a certain annual yield of fat. For the Red Spotted, cows must give 220 lbs. of fat, and bulls 265 lbs. out of dams giving 265 lbs. The minimum for Ayrshire cows is 220 lbs. during each of two successive years.

To facilitate the purchase of good breeding stock, each of these societies holds two auction sales a year; at these, registered bulls, free from tuberculosis and approved at an inspection immediately preceding the sale, are offered to the public.

During the present year, two new societies have been founded to work on the same lines as those already mentioned, one for the Friesian breed and another for the Swedish Red Polls.

SECOND PART.
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

1126 - National School of Waters and Forests at Nancy (France). — Given in *La Vie agricole et rurale*, Year II, No. 35, pp. 224-230. Paris, August 2, 1913.

A State School of Forestry was founded in France in 1824, and years later was established at Nancy where its headquarters have remained ever since. These consist both of educational buildings and of residential quarters for the State scholars and for the staff; special mention should be made of the museums, where extensive forestry collections of different kinds have been accumulated. There are further 7625 acres of forest under the direct management of the School; the greater part of this is in the neighbourhood of Nancy (Forests of Haye and of Amance) and the rest in the Vosges Mountains about 40 miles distant (Forests of Rilleux and Ban d'Étival). These four forests provide examples of various types of forest management, and together with a nursery on the outside of the Haye Forest, where there is also a piscicultural experimental station and an arboretum at Amance, complete the equipment of the School.

The students may be divided into two classes: the so-called "regular" students or State scholars and the "free" students. The former are those who have already taken their diploma at the State Agricultural College ("Institut National Agronomique") and have further been subjected to a competitive entrance examination in mathematics and modern languages. Occasionally a graduate of the Polytechnic School ("École Polytechnique") is admitted directly and without competition. The total number of these State scholars varies from 12 to 35 according to the needs of the Forest Service, and at present they number 18. When entering the School they sign a contract for four years, the first and last of which are spent doing military service, while the two intermediate years are spent at Nancy. During the latter period, the scholastic year is divided into two terms: the winter term from October to April, when the work con-

of lectures and laboratory work, and the summer term April to June, when the work is wholly of a practical nature and takes place in school forests. Further, during the two years, two months are spent in school forests in other parts of France, and throughout the whole course a certain amount of military instruction is given and a fairly strict discipline maintained. After leaving Nancy the State students complete their military service by serving for a year as sub-lieutenants in an infantry regiment and then pass into the State Forest Service.

The second class of students consists chiefly of foreigners, who are admitted to the School and allowed to follow the course of instruction wholly or partly. The latter embraces forestry and its applied sciences, forest engineering and forest law.

The teaching staff consists of seven members of the Forest Service, a military instructor, and a lecturer in Letters and modern languages, the management of the School forests is in the hands of two special officers who were originally appointed to take charge of the experimental work.

Travelling Schools for Rural Domestic Economy (France).—DUCLOUX, A. *La Vie agricole et rurale*, Vol. 2, No. 38, pp. 305-308. Paris, August 23, 1913. Though the first travelling school for Rural Domestic Economy in France was founded in December 1905, at the present day 30 such schools and 2 others are to be opened shortly, and the formation of yet 6 others is under discussion. Many of them give short summer courses in training for the farmers of their districts. On the whole it may be said that the instruction is appreciated by farmers and their families, and that the movement is proving a success.

The Agricultural Institutions of Spain.—DE LA ROSA, GUMERSINDO FERNÁNDEZ. *Apuntes históricos sobre los progresos de la agricultura española en los cincuenta años últimos.*—*Boletín de agricultura técnica y económica*, Year V, Nos. 49-54, pp. 63-72, 167-176, 236-244, 335-345, 449-460, 521-532. Madrid, January-June, 1913. This article gives a historical summary (accompanied by general remarks on rural and political economy) of the more important facts concerning the progress of agriculture in Spain, especially in the south-west district, during the course of the last fifty years. The writer brings into prominence measures taken by the Government for the encouragement of agricultural and agricultural instruction.

A Royal Decree of 1855 founded the "Escuela general de Agricultura". One of the first agricultural engineers who studied there founded, in 1862, the "Sociedad El Fomento Agrícola" at Jerez de la Frontera; to this society the introduction into Spain of the first mowing and threshing machines, innovations, and the introduction of *Hedysarum coronarium* L. ("sulphur" which necessitated horse-rakes and hay-makers, into the southern district of the Peninsula, gave a great impetus to agriculture and to breeding industries in that district.

From 1875 to 1879, the extension of the "Instituto Agrícola de Alfonso XIII" was provided for by a series of legislative enactments. This Institute

was the former "Escuela general de Agricultura". The law of August 1876, dealing with agricultural instruction, created chairs of agriculture in all the colleges ("Institutos") of the Kingdom. The "Asociación de agricultores de España" dates from about the same time, and is the merit of having organised shows, competitions and congresses. The "Exposición Nacional Vinícola" of 1877 was on a magnificent scale. Unfortunately, phylloxera made its appearance shortly afterwards in Spain and destroyed over 7 million acres of vineyards. The spread of the pest was arrested by reconstituting the vineyards with vines on American stocks.

The Royal Decree of February 14, 1879, created the "Cuerpo de Ingenieros agronomos", and the "Junta consultiva inspectora". In 1880 a stallion depôt was added to the "Instituto Agrícola de Alfonso XII" which was later attached to the "Estacion pecuaria de la Granja central" this latter is still in existence.

The Royal Decree of December 9, 1887, gave its sanction to the organisation of the Corps of Agricultural Engineers; another decree dated December 13, 1887, provided for the creation of different Experimental Farm Schools ("Granjas-Escuelas experimentales de Agricultura"). The "Granja experimental" of Saragossa contributed in a great measure to the improvement of beet cultivation; this crop has in some parts (in the neighbourhood of Malaga and Motril) replaced sugar cane. The first beet sugar factory was established in 1882 at Cordova; others were subsequently opened at Grenada, Antequera, Aranjuez and Vico.

The oldest of the model farms which still exists is (after the "Granja central", annexed to the Agricultural school of Moncloa) that of Saragossa which was established by Royal Decree of September 23, 1887. The same decree also created the model farms of Grenada, Seville and Valladolid; these were, however, suppressed after some years. A Royal Ordinance of June 2, 1882, instituted the "Granja levantina," which is situated in the "Jardin Real" near Valencia; on January 16, 1889, the "Granja-Escuela experimental" of Jerez de la Frontera was created, followed during the same year by the model farm of Corunna, and the next year by that of Barcelona. Those of Valladolid, Valencia, Jaén, Badajoz and Ciudad Real have not been in existence for some ten years; the model farms of Navarre and Santa Cruz (Teneriffe) are in course of development; those of Melilla (created in 1910), Salamanca (created 1911), Cordova, and the Balearic Isles (created in 1912) are beginning operations.

To the "Escuela Especial de Ingenieros agronomos" and the "Granja Central" are annexed stations for the following branches: agriculture, plant diseases, seed selection, vine growing, stock breeding and machine tests. For a long time, vine-growing stations have existed at Haro, Villafranca, Pandoes, Toro, and Reus (the latter is now transformed into the school of Vine Growing and Wine Making); while those of Calatayud, Cocentaina, Jumilla, Requena, Valdepeñas, Aranda de Duero, Felanitx (Balearic) and Orense are of more recent date. Funds have been granted for the establishment of 14 "Estaciones de Agricultura generale" at Arevalo, Albas, León, Lórcá, Segovia, Zamora, Asturias, Burgos, Castellón, Motril, Malt

res, Fonsagrada and Alcalá de Henares. There is a Sericulture Station at Murcia, and others are about to be established at Aranjuez and Puerto Santa Maria (Cadiz). Dairy Industry Stations exist at San Felices de los Baños (Santander) and at Nava (Oviedo); and there are Stations for Irrigation at Binéfar (Huesca), as well as at Seville ("Granja provincial de Irrigación XII"), a Rice Culture Station at Huesca (Valencia), and experimental oliveyards at Tortosa (Tarragona), Hellin (Albacete) and Lucena (Córdoba).

The law of July 17, 1895, regulates surveying operations. In accordance with Royal Decrees of August 14 and of October 20, 1895, a trial beginning in 1896 was made in the Province of Granada. The law of August 24, 1896, provided for the establishment of the survey of crops. In 1899, surveys were made in the Provinces of Cadiz, Cordova, Malaga and Seville. The present law of survey was regulated by the law of March 23, 1906.

Since 1900 the Government has given a great impetus to irrigation works. A Royal Ordinance of 1903 commanded the publication of the work entitled "El regadío en España" (Irrigation in Spain) compiled by the Council of Agriculture from the reports forwarded from the provinces by agricultural engineers. The Royal Decree of May 11, 1900, reorganized the Hydrological Service; seven divisions were created for hydraulics, and important works for canals and reservoirs were begun; some of these are in course of construction. At the present time, Spain possesses nearly 4 million acres of irrigated land (counting the areas which are irrigated when water is abundant).

It has long been known that the cotton plant flourishes in some parts of Spain; nevertheless, the Spaniards have almost entirely ceased cultivating this crop. With a view to encouraging the cotton-growing industry, a law of July 19, 1904, granted £16,000 in prizes (to be awarded over three years), and also exempted the cotton crop from taxation. The Council of Agriculture was charged with drawing up the regulations for the execution of the said law, but their precautionary and restrictive measures (published by a Royal Decree on January 28, 1906) made the latter a dead letter.

In conclusion, the writer gives some suggestions as to the part which should be played by the Government and the administration in the encouragement of agriculture, and the best measures to be adopted in order to secure success.

The Financial Measures of the Prussian Chamber of Agriculture. — *Annalen in Volkswirtschaftliche Blätter*, Year XI, No. 10-11, pp. 135-138. Berlin, June 10, 1903.

In order to guarantee for the future the financial resources of the German Chambers of Agriculture, the law of June 30, 1894, dealing with the Chambers, accords to them the right of levying a certain tax upon the cultural properties of their district which are over a certain size.

§ 19 of the above mentioned law runs as follows:

"The total tax levied must, in general, not exceed one-half per cent. of the net return of the land tax; only in extraordinary cases, and with the permission of the Minister, may this figure be exceeded". This paragraph

TABLE I. — Taxes levied by the Chambers of Agriculture.

[illegible]

mentions that the Chambers of Agriculture must publish an annual sheet, and submit the latter to the Minister, while at the same time have complete autonomy in the management of their bank, and their keeping operations.

Table I, which is based upon the "Statistische Nachweisungen aus dem Reich der Landwirtschaftlichen Verwaltung von Preussen", shows how, in recent years the Chambers of Agriculture have used the power entrusted to them.

This table reveals a tendency to the progressive increase of the tax; in 1913 there were still seven out of the thirteen Chambers of Agriculture in Prussia which had not reached the legal limit of a levy of $\frac{1}{2}$ per cent. on the return of the land-tax, and only one which had already over-stepped the limit, in 1910 none of them had remained within the limit, and nine of them had already, with the authorization of the Minister, passed it. The sum of the taxes collected by the Chambers of Agriculture was about 100 in 1903, and amounted in 1910 to about £ 120 000.

Table II shows the total expenses of the different budgets of the Chambers of Agriculture since 1903.

After a comparatively slight increase in the expenditure from 1903 to 1910, since the latter date there has been a regular increase of about £ 50 000 in the annual expenses of all the Chambers of Agriculture, since they rose from £ 420 000 in 1904 to about £ 700 000 in 1910. This increase is noticeable in all the clauses of the budget, but especially in the one dealing with the encouragement of forestry, which has risen from £ 3100 to £ 11200, three or four times the original sum.

The chief increase in expenditure is furnished by the sections providing for the encouragement of scientific work and instruction, and for the promotion of stock breeding. These two sections alone represent the chief part of the Chambers and account for over half their expenditure.

The progressive increase of the receipts corresponds, in some measure, to that of the expenses. The receipts proper to the Chambers are by far the smallest and they have increased much more rapidly than the Government grants. Indeed, since 1903 the receipts proper of the Chambers of Agriculture have risen from £ 230 000 to £ 460 000, while during the same period the Government grants have increased from £ 120 000 to £ 190 000.

As appears on comparison with Table I, the increase in the expenses of the Chambers does not so much depend upon the increase of land-taxes (i. e. their more strict enforcement) as upon the larger receipts of other sections of the Chambers (duties, school fees, sale of publications, etc.).

The figures given show very clearly the extraordinary development of the Chambers of the Prussian Chambers of Agriculture.

TABLE II. — Budget

EXPENDITURE					
Financial Year	I For scientific objects and instruction	II For veterinary attendance	III For the encouragement of stock breeding	IV For the encouragement of fish breeding	V For the encouragement of forestry
1	2	3	4	5	6
	£	£	£	£	£
1903 . . .	116 857	24 938	95 503	2 778	3 113
1904 . . .	120 317	21 480	98 805	2 392	4 420
1905 . . .	132 303	34 224	105 497	2 497	5 476
1906 . . .	138 152	36 799	111 459	2 951	6 247
1907 . . .	161 839	37 675	131 190	3 388	6 616
1908 . . .	172 974	40 018	135 891	3 572	7 252
1909 . . .	213 505	40 478	147 625	5 030	8 238
1910 . . .	255 305	43 774	155 391	5 773	11 150

In 1910 the "Verein für Landwirtschaft und Gewerbe" in Hohenzollern

632 ½	915	1 ½
-------	-----	-----

N. B. — The great increase in the figures in column 2 « Scientific objects and instruction » is due to the fact that the cost of periodicals and other publications of the Chambers was no longer included in the budget.

1130 — Resolution of the Swedish Authorities on the Subject of the Future of the Swedish Station for the Improvement of Seeds. — *Swedish Agricultural Journal*, pp. 142-223. 1913.

The Svalöf Station for the improvement of field crops, founded in 1889 by private initiative, has hitherto belonged to the Swedish Association for the Improvement of Seed, notwithstanding the fact that the increasing subventions granted by the State have rendered it more and more dependent upon the Government. (1)

Owing to the always greater extension of its work and to the

(1) See Dr. HJALMAR NILSSON's original article: « The Swedish Institute for the Improvement of Field Crops at Svalöf », *B.* June 1913, pp. 834-843.

of Agriculture.

		RECEIPTS				
1	VIII Administration of the Chambers	Total expenses	Total receipts	Government grants	Other grants from Provinces, ecc.	Receipts proper
	9	10	11	12	13	14
	£	£	£	£	£	£
6	77 771	403 465	399 823	123 628	39 796	236 399
11	75 779	414 255	417 829	131 775	38 844	247 210
8	92 350	459 871	455 373	138 647	39 631	277 095
10	97 115	508 519	508 343	146 476	43 195	318 672
14	126 227	585 242	572 040	162 068	49 561	360 412
16	112 144	625 276	616 015	182 355	55 284	378 377
18	112 692	655 456	659 633	179 678	56 530	423 425
24	90 049	703 775	697 804	187 492	56 427	453 885

for the first time. It furnished the following figures:

86	163	1 952	1 899	1 471	15	413
----	-----	-------	-------	-------	----	-----

large decrease in the administrative expenses (column 9) in 1910 are due to the fact administrative expenses, but to the fund for the promotion of scientific objects and

give the employees of the establishment a surer and more advantageous position, a request for the increase of the subvention was made (the increase is so considerable that out of the total required revenue, estimated £7414, the subvention alone figures for £4950), and the question was asked whether the State should not take over the establishment as one of its institutions.

This change was supported by the Royal Direction of Agriculture (Landbruksstyrelsen), which proposed however that the establishment should be managed by a special board nominated by the King and consisting of seven members.

In order to ensure intimate cooperation with the Central Institute of the State possesses at Stockholm, in which other branches of agricul-

tural experimentation are carried out, it was proposed that two of the members should be on the board of both of these institutions.

According to the measures proposed by the Government and approved by Parliament, the establishment will continue to belong to the Swedish Association for the Improvement of Seeds, in order that it may preserve that liberty of form which seems to have been so favourable to its development. The managing committee will consist of seven members, of whom five will be nominated by the Government and two by the Association for the Improvement of Seeds; a close cooperation with the State Central Institute will be obtained by means of two members belonging to both boards and by the discussions of the scientists of the two institutions. A laboratory will be installed for the chemical experiments required by the establishment. The State subvention is fixed at £4 950 for the year 1904. It is estimated that the Association that receives the improved seeds and disposes of them commercially will give £2 200, while other sources of revenue will yield £264.

In case the sum that the commercial association will have to pay according to the agreement approved by the Government should exceed the sum estimated in the budget, the excess will be put aside as an asset for the budget of the following year, thus allowing the contribution of the State to be diminished.

1131 - Agricultural Shows.

Belgium.

1912. Nov. 8-10. Brussels. — Poultry show organized by the Brabançonne Club. Address to M. Pirard, Nivelles, or M. W. Collier, 97 Rue des Cailloux, Jette.
- Nov. 8-10. Borgerhout (Antwerp). — National poultry show organized by the "Nieuwche Society of Borgerhout. Address to the secretary: M. Eug. Dierckx, Chaussée de Tuinhout, 221, Borgerhout, Antwerp.
- Nov. 15-17. Renaix (East Flanders). — International poultry show organized by the Pigeon Club. Address to the president: M. Otto Rose, Renaix.
- Nov. 15-17. Charleroi. — International rabbit show organized by the "Canicole Club of the Charleroi valley. Address to: M. Pévenasse (secretary of the club), Charleroi.
- Nov. 29-30. Ghent. — Annual international poultry show organized by the "Nieuwche Poultry Society. Address to the secretary: M. A. Heyndrickx, 3 Rue du Saint Esprit, Ghent.
- Dec. 14-15. Mont-sur-Marchienne. — National poultry show organized by the "Club avicole et canicole". Address to: M. Léopold Germain, Place du Wez, Mont-sur-Marchienne.
- Dec. 20-22. Antwerp. — Eleventh international poultry show, organized by the "Club avicole universels". Address to: 28, Rue Torfs, Antwerp.
1914. Feb. 7-9. Iseghem (West Flanders). — Fourth international poultry show organized by the "Hoenderbond 't Neerhof". Address to: M. Valère Laridon, Café Royal, Iseghem.

France.

1912. Nov. 12-16. Paris, Grand Palais. — International poultry show organized by the "Société Nationale d'Aviculture de France". This show will include fowls, ducks, geese, turkeys, rabbits, pigeons and dead poultry; there are a great many prizes in kind and the object of art offered by the President of the French Republic, money prizes offered by the Ministry of Agriculture and the General Council of the Seine, gold and silver medals, etc.

Aug. 17-19. Lille. — Fifteenth international poultry show organized by the "Les Aviculteurs du Nord" Society. Address to the general secretary: M. Emile Desreumaux, 92 Rue Franklin, Roubaix, Nord.

March. Nice. — General agricultural and horticultural show organized by the "Société Centrale d'Agriculture et d'Horticulture". Address to the secretary: 113, Promenade des Anglais, Nice.

May. November. Lyons. — Permanent horticultural show, comprising: fruit-bearing and ornamental plants; instruments, machines and apparatus for use in the various branches of horticulture; plans, designs, books and publications on the subject. There will be three temporary shows of horticultural produce, as follows: June 5-9, Sept. 4-9; Nov. 21-27. Horticulturists and amateurs wishing to exhibit should make application in writing to the Mayor (M. le Maire de Lyon, Secrétariat de l'Exposition, Hôtel de Ville, Lyon), twenty days before the opening of each of the shows, indicating the number and nature of the exhibits and the space required.

Germany.

Oct. 22-23. Königsberg. — Sixty-first show and sale of live stock, organized by the "Ostpreussische Holländer Herdbuch-Gesellschaft". The catalogue of the animals shown may be obtained from the offices of the society: Beethovenstrasse 24-26, Königsberg 1. Pr.

Nov. 22-23. Karlsruhe (Baden). — Rabbit show organized by the "Badenia" Rabbit Society.

May 5-7. Berlin. — Thirty-eighth Berlin Fat Stock Show.

German East Africa.

Messalam. — General exhibition for German East Africa, organized by the Permanent Exhibition Committee for German Industries ("Ständige Ausstellungs-Kommission für die deutsche Industrie"). Address: Berlin, N. W. 40, Roonstrasse 1.

United States of America.

Cattle shows and fairs:

Oct. 28-Nov. 7. Jackson, Mississippi.

Nov. 3-8. Phoenix, Arizona.

Nov. 5-12. Shreveport, Louisiana.

Nov. 22-29. Fort Worth, Texas.

Horse shows and fairs:

Nov. 15-22. New York.

Nov. 24-29. Fort Worth, Texas.

Dec. 1-6. Chicago.

Agricultural Congresses.

United States of America.

Oct. 22-Nov. 1. Tulsa (Oklahoma). — Eighth International Dry-Farming Congress.

Applications for the report (costing one dollar) should be addressed to: Sir John Burns, Executive Secretary-Treasurer, International Dry-Farming Congress, Tulsa, Oklahoma.

CROPS AND CULTIVATION.

- 1133 - On the Circulation of Sulphur and of Chlorine on the Earth, and the Importance of this Process in the Evolution of Soils and in the Vegetable World. — KOSOVITICH, P. (Bureau for Agricultural Science of the Scientific Committee of the Central Administration for the Organization of the Land and Agriculture), in *Russisches Journal für Experimentelle Landwirtschaft*, Vol. XIV, 2, p. 181. German Edition, p. 218. St. Petersburg, 1913.

The writer treats specially the following subjects :

- I. The chlorine and sulphur contents of rocks and soils
- II. The quantities of chlorine and sulphur which are brought to surface of the earth and to the soil by atmospheric precipitations.
- III. The quantities of chlorine and sulphur that are washed off the soil by subsoil waters.
- IV. Part played by the chlorine and sulphur conveyed by the atmosphere in the evolution of the soil.
- V. Chlorine and sulphur content and requirements of plants.
- VI. General considerations on the circulation of chlorine and sulphur in nature.

CHAPTER I. — *The chlorine and sulphur contents of rocks and soils*

On the basis of analytical data, mostly taken from the existing literature on the subject, the writer comes to the following conclusions :

1) *Crystalline eruptive rocks* rarely contain more than 0.1 per cent. chlorine ; the most widely spread rocks generally contain still less, in only traces. The amount of sulphur in the same rocks is higher than of chlorine and often exceeds 0.1 per cent.

2) *In clastic and sedimentary rocks* chlorine in slightly soluble form is completely lacking ; it is present only in the form of easily soluble compounds generally in traces.

3) *In soils*, chlorine in slightly soluble forms is not present ; the compounds that have been observed are due to easily soluble salts. Sulphur is present in the soil in certain quantities in slightly soluble form, but they are large ; according to available data, the total amount of sulphur in the soil is found in the humous layer, and is 0.04 per cent. corresponds to 0.1 per cent. of SO_3 ; in soils rich in humus, such as the Chernozem, it reaches 0.1 per cent. The sulphur contents of the soil decrease considerably with the depth.

CHAPTER II. — *Chlorine and sulphur in atmospheric precipitation*

On the strength of material collected in eight localities of European Russia and of the data available for other countries, which are taken from N. H. J. Miller's treatise "The amounts of nitrogen as am-

nitric acid, and of chlorine in the rain-water collected at Rothd" (*The Journal of Agricultural Science*, Vol. 1, Part 3), the writer has himself justified in drawing the following conclusions.

A. For Chlorine.

- 1) The chlorine content of the several atmospheric precipitations varies in different parts of the world and within very wide limits: from 0.4 to 58.11 per million. In the analyses made for Russia the lowest chlorine content found in one determination was 0.42 per million (Shatilov Experiment Station), the highest 58.11 (Borovoje Forest Experiment Station).
- 2) The yearly averages of the chlorine content of atmospheric precipitation varies in the different parts of the world within much narrower limits: from 1.46 per million (Konstantinov Meteorological Observatory in the neighbourhood of St. Petersburg) to 9.72 (Island of Ceylon), when Guardia in is not considered, in which locality the exceptionally high figure of 31.20 per million is recorded. For the localities in Russia which have been examined the differences are still smaller, the lowest chlorine content (Konstantinov Observatory) being 1.46 and the highest (Borovoje) 4.00. In general it may be assumed that the atmospheric precipitation of the interior of the country ranges in chlorine content between 2 and 3 per million.
- 3) The amount of chlorine contained in the atmospheric precipitation varies chiefly on the position of the locality with regard to the seas and rivers; on approaching the latter the amount of chlorine increases. Also in the neighbourhood of salt lands the precipitations may be richer in chlorine. Generally slight precipitations contain more chlorine than the heavier ones.
- 4) The quantities of chlorine which fall in one year with the atmospheric precipitations per unit of area vary also very considerably in the various parts of the world. According to available data the lowest quantity of chlorine was observed at the Konstantinov Observatory, namely 7.09 lbs. per acre; the highest at Guardia in Spain, 399.5 lbs. per acre. But the yearly average of chlorine in most territories varies between 8.92 and 22.30 lbs. per acre. Among the Russian localities examined the first place belongs in respect to the Forest Institute (near St. Petersburg) where each acre received 14.98 lbs. of chlorine.

B. Sulphuric Acid.

- 1) The lowest content in sulphuric acid per million parts of atmospheric precipitation sank in the single determinations lower than the chlorine content, namely to 0.28 of SO_2 (Sapolje Experiment Station). The maximum was 14.17 (Mariupol Forest Experiment Station). The yearly average of sulphuric acid in the precipitation in the Russian territories that were investigated was 1.93 (Shatilov Experiment Station) and 14.17 (Mariupol Forest Experiment Station). At localities within the area of influence of large cities, factories, railways, etc., the amount of sulphuric acid contained in the atmospheric precipitations has been determined by the writer to be above 10 parts per million, while in the country it lies between 2 and 3.
- 2) The quantities of sulphuric acid per unit of area which fall to the ground with the precipitations vary considerably in the localities examined. Places

which are not under the influence of chimney smoke get yearly about 8 kg of SO_2 per year. In the neighbourhood of towns and industrial works the yearly amount reaches almost 72 lbs. In such localities the greatest portion of the sulphuric acid falls in winter. Thus, for instance, at Forest Institute one-third falls during the summer half-year and two-thirds during the winter half. Localities in the country do not show much difference in the quantities that fall during the various seasons.

CHAPTER III. — *The quantities of chlorine and sulphur contained in subsoil waters.*

On the basis of theoretical speculations the writer gives the following characters of subsoil water :

1) The percentage of chlorine and sulphur in the water in the soil and subsoil is in general higher than that in atmospheric precipitations;

The general and fundamental cause of this greater percentage is evaporation, both directly from the soil and through vegetation, of a portion of the water received as atmospheric precipitation.

2) As the ratio between the water that penetrates into the soil from the atmosphere and that which evaporates varies between wide limits so do the relative chlorine and sulphur contents of soil and subsoil water vary greatly. In special cases these contents increase owing to a whole series of concurring causes.

3) The percentage of chlorine and sulphur in the soil water of any locality may, under certain conditions and when the amounts of these elements contained in the atmospheric precipitations are known, furnish data by means of which the evaporation of water from the soil or the relative quantity of soil water that are formed, may be determined.

4) The chlorine and sulphur content of the water in the soil varies not only with the locality, but from year to year and from season to season and changes in the course of years.

CHAPTER IV — *Part played by the chlorine and sulphur, which are conveyed by atmospheric precipitations, in the evolution of the soil.*

The writer considers exhaustively the two following questions : first what length of time is necessary for the chlorine and sulphur of the atmosphere to transform a soil into a salt soil when there is no formation of subsoil water ; secondly what is the least quantity of subsoil water necessary in order to carry away all the chlorine and sulphur introduced from the atmosphere. At the conclusion of the chapter the writer formulates the following propositions :

1) As primitive rocks contain only small quantities of chlorine and sulphur, and these in the processes of weathering and soil forming are transformed into soluble compounds and rapidly leached out, the material

juence would be a relatively rapid impoverishment of the soil in two elements, until their complete disappearance took place. As the development of plants is impossible in the absence of sulphur, continuous introduction of sulphur from the atmosphere a necessary condition for vegetation and for the evolution of the soil.

) In soils and subsoils in which, in connection with a dry climate, underground waters are not formed, an accumulation of sulphur and chlorine due to atmospheric precipitation must take place. If it be assumed as an approximation that the soil receives from the atmosphere only 4.46 lbs. of chlorine and 46 lbs. of SO_2 per annum (which corresponds to about one-half of the estimated amounts of these substances which are received per acre and per year), the author calculates that it would take 12000 years to collect 0.5 per cent. of each of these substances in a layer 3 ft. 3 in. deep; in this case it would be a decidedly salt soil which would contain about 1 per cent. of chlorine and sulphur compounds. But to render a soil too salty for most cultivated crops, which it becomes when it contains 0.05 per cent. of chlorine, years would be sufficient, and these from a geological point of view constitute but a brief period.

) If, on the contrary, there is formation of subsoil waters, it requires small quantities of them to leach out completely the chlorine and sulphur compounds conveyed to the soil by atmospheric precipitations. Thus the quantities assumed above, namely 4.46 lbs. of chlorine and the same of SO_2 , would require about 720 cub. ft. of water per acre to leach them out as a 0.01 per cent. solution, which would be equal to a layer of water of about 1.2 inches; consequently the formation of a relatively insignificant quantity of subsoil water is sufficient to prevent an accumulation of chlorine and sulphur compounds in the soil.

CHAPTER V. — *Quantities of chlorine and sulphur contained in and required by plants.*

The writer discusses these points principally in connection with Russia. On the strength of the available Russian and North American data the following conclusions are arrived at:

) Determinations of sulphur content carried out with all due precautions show that plants themselves, not on the ash, show that cultivated crops are very rich in this element: in some of them, such as cabbage, turnips and other vegetables, the sulphur content is higher than the content in phosphorus. In other plants, for instance red clover, lucerne and sugar beets the two elements are present in equal quantities; cereals especially are poor in sulphur, containing about twice as much phosphorus as sulphur.

) According to the above data, the sulphur content, expressed as SO_2 referred to air dry matter, ranges in the grain of cereals from 0.29 to 0.45 per cent. in straw between 0.26 and 0.55 per cent. Clover hay contains 0.45 per cent. of SO_2 , lucerne hay 0.50 per cent. Peas contain 0.45 per cent. (Phaseolus) 0.58 and soy beans 0.85. In some crucifers the sulphur

content exceeds 1 per cent.: in turnips it is 1.85 and in cabbage 2.05 per cent. of SO_2 .

3) The quantities of sulphur which are removed by average crops on an acre may be expressed by the following figures: for cereals 6.25 to 10 lbs. of SO_2 (in crop of 1338 lbs. of grain and 1962 lbs. of straw per acre); for red clover 16.06 lbs. (4014 lbs. of hay); for lucerne 26.76 lbs. (5353 lbs. of hay); sugar beets about 44.6 lbs and cabbage 65.13 lbs. (in a crop of 3222 lbs.).

4) The sulphur derived from atmospheric precipitation is sufficient to satisfy the wants of relatively abundant crops of cereals only, but on condition that there be no leaching out of sulphur; for if there is any such loss the cultivation of such plants unless accompanied by appropriate manuring will gradually lead to a shortage of sulphur and the crops will diminish until an equilibrium gets established between the sulphur brought down from the atmosphere and that taken up by the plants and leached out by soil water.

5) On the other hand, in localities situated near towns and industrial centres, the wants of such plants as are most exacting in their sulphur requirements can be completely satisfied by the quantities furnished by the atmosphere. In making and judging experiments on the requirements of sulphur in the soil the above mentioned great differences in the amount of sulphur given up by the atmosphere according to locality must be taken into account. This especially in treating the question of soil sickness in connection with clover and in dressing clover with gypsum.

6) The reserves of sulphur in the soil cannot be considered as being unlimited in comparison with the requirements of plants as to this element. An average sulphur content of the soil (in the upper layer one foot deep 0.1 per cent. SO_2 , in the next 2 ft. 3 in. 0.025 per cent.) amounts to about 500 lbs. per acre in a layer 3 ft 3 in. deep; one half of this amount corresponds to 285 cereal crops or 70 lucerne crops.

All the preceding data and considerations show that in certain cases an impoverishment of the soil as to sulphur and a shortage of this element in the nutrition of plants is possible, and consequently that sometimes in the succession of heavy crops the introduction of sulphur by means of suitable manuring becomes necessary.

CHAPTER IV. — *General considerations. On the circulation of chlorine and sulphur on the globe.*

It is specially emphasized that at present the circulation of chlorine consists chiefly in a mechanical transport between the land, the seas, the atmosphere, and in the form of that simple combination in which chlorine is prevalently found.

The circulation of sulphur is considerably more complicated: on the one hand sulphur is subject to a continuous passing from an inorganic to an organic form and vice-versa, on the other it undergoes oxidation and reduction processes in most of which micro-organisms take part.

The Condition of Soil Phosphoric Acid Insoluble in Hydrochloric Acid.—

W. H. (Scientist in Soil Laboratory Investigations, Bureau of Soils, U. S. Department of Agriculture), in *The Journal of Industrial and Engineering Chemistry*, 1. 5, No. 8, pp. 664-665. Easton, Pa., August 1913.

The official method for the analysis of soils is accomplished by digesting a known quantity (10 grams) of the soil in hydrochloric acid, specific gravity 1.115, for ten hours on a steam or water bath, and then analysing the solution thus obtained for the constituents which it is desired to determine.

This method does not invariably give the total amount of phosphoric acid present in the soil analysed. The writer gives the values obtained in a study of the chemical composition of Maryland soils; the average percentage of phosphoric acid extracted was about 57.6 per cent. In the same series of Virginia soils, in every case except one, gave less amounts of phosphoric acid than the total amount obtained by the fusion method. There are two explanations for this:

- a) The phosphoric acid not extracted by the official method is present in the soil in compounds insoluble in the acid used.
- b) It is present in a soluble form from which it is protected from the action of the acid.

We have no means of directly testing the first of these possibilities. Mineral phosphates have, however, been found which their finders are insoluble in hydrochloric acid. None of these insoluble phosphates have been discovered in the soils examined by the Soil Bureau; they do exist in them the quantity present must be extremely small, and the amount of insoluble phosphoric acid present in minerals which carry the former as an essential ingredient, or which is present in forms derived from the interaction in the soil solution, must be very small indeed.

As regards the second possible explanation, mineralogical analyses have shown that a very large number of soils contain apatite, a hydrochloric acid soluble calcium phosphate, enclosed in quartz grains. Such soils are subjected to acid digestion, and the apatite was found still inclosed in quartz, and apparently unattacked.

In conclusion, it may be said that possibly a very minute quantity of phosphoric acid is present in soils in compounds which are insoluble in hydrochloric acid, but a large part of the phosphoric acid not extracted is in a soluble form, i. e., as apatite, which is protected from the action of the acid.

The Question of the Inoculation of New Crops on Moor Soil.—RAMM, E.

Österreichische Landwirtschaftliche Zeitung, Year 33, No. 66, p. 597, 1 fig. Berlin, Oct. 16, 1913.

The inoculation of new crops on moor (1) soil, whether by means of inoculum or of pure cultures, is a matter of much difficulty when it is a ques-

We translate the German "Hochmoor" as "moor", and "Niedermoor" as "low moor".
cf. TANSLEY: "Types of British Vegetation", pp. 208-213.

tion of thus treating hundreds of acres. For this reason, attempts for many years been made on the State farm in the Wiesmoor to substitute a dressing of nitrate of soda (180 lbs. per acre) for inoculation. The attempt has been most successful: the crops grew well right from the start and developed in a thoroughly satisfactory manner.

From this time, all new crops in the Wiesmoor have been thus prepared and the results have been uniformly successful and no interruptions in the cultivation operations have occurred. In 8 to 14 days after germination, roots of the clovers and other Leguminous plants show plenty of nitrogen nodules.

On areas which have not been inoculated or manured with nitrate the root nodules do not make their appearance until much later, generally not until about eight weeks have elapsed. Further, the crop, as a rule, shows gaps which only fill up after some time.

It should be the task of science to ascertain the source of the bacteria which, on the application of nitrogenous manure, produce such a general and regular crop of nodules on the roots, and to account for the increased bacterial receptivity possessed by plants with nitrogenous manuring.

The practical results of the experiments on the Wiesmoor show that where new crops must be sown throughout the spring and summer, a nitrogenous manure is less troublesome and much more certain in its effects than inoculation; thus the application of easily soluble nitrogen is preferable from an economic stand-point. With a nitrogenous manure, the success of newly-sown crops can be more surely reckoned upon, while there are frequent failures in the case of inoculation. The areas receiving the nitrogenous manure develop so well that the cost of the fertilizer is paid by the time of the sowing year to account. If the greater certainty is taken into consideration, a nitrogenous manure is also cheaper than inoculation. Further experiments should show how far the above-mentioned results are affected by the application of nitrate of soda in larger or smaller amounts than 180 lbs. per acre employed in this case.

1136 — **Experiments on Denitrification.** — TCHIRIKOV TR. and SCHOAUCK, A. In *Izvestia Moskovskago Sel'skokhoziastvennago Instituta*, Year XIX, Part 2, pp. 270-285. Moscow, 1913.

Three series of experiments on denitrification conducted at the Agricultural Institute at Moscow.

I. *Influence of moisture on the course of denitrification in the presence of straw in progressive doses.* — Experiments carried out in sandy loam soil with different degrees of moisture: 40, 60, 80 per cent. of the water capacity of the soil. The results obtained were the following:

1. Oats both without straw and in doses of 0.25 to 1 per cent. of the soil in pots, developed best with 80 per cent. of moisture.
2. A diminution in the yield of oats was observed with increased doses of straw and this with various degrees of moisture.
3. This diminution of yield took place more rapidly with 80 per cent. moisture; with less moisture it was less intense.

4. In general an increase in the degree of moisture favours the depressing influence of the straw both on nitrate of soda and on sulphate of ammonia.
5. The decrease of yield caused by the application of 0.25 per cent. of straw is equivalent to that caused by a reduction of the degree of moisture 30 per cent.

II. *Addition of carbonate of lime in the presence of straw.* — The addition of carbonate of lime diminishes the depressing effects of straw considerably and completely. The favourable effects of carbonate of lime are already visible with a dose of 0.25 per cent. of the earth; but on increasing the dose per cent. there was no further increase of yield.

III. *Action of sugar starch and straw.* — Experiments of cultivation and with additions of sugar, starch and straw, in doses of $\frac{1}{8}$ to 1 per cent. of sand. The plants grown (oats and mustard) developed least with next came starch and straw. As for the balance of nitrogen the writers give the following principal observations:

1. The depressing action on plants caused by the addition of the above named substances is not due to a real denitrification.
2. The nitric nitrogen of the soil gets converted into albuminoid bodies, depriving the plants of a considerable part of the assimilable nitrogen.
3. The percentage of nitrogen in plants is the greater the more their development is depressed.
4. The addition of organic substances in the presence of nitrates causes reduction of an alkaline medium and in direct ratio to the quantities added.

Irrigation Resources in California and their Utilization. — ADAMS, F. (under the direction of FORTIER, S.) — U. S. Department of Agriculture, Office of Experiment Stations, *Bulletin* 254, pp. 95, 9 maps. Washington, June 1913.

For many years the United States Geological Survey has been mapping topography, measuring streams, and studying underground waters in California, and engineers of the Reclamation Service have been looking for possible developments of unreclaimed land. In 1910 the Office of Experiment Stations directed an irrigation census of California, and in 1912 the Commission of California published three full reports dealing with Northern, Central, and Southern California respectively and the irrigable land of each section, together with discussions of water supplies, their uses, and estimates of future possibilities. The present Bulletin summarizes these and records the results of a further series of field investigations made by the Office of Experiment Stations in cooperation with the Commission during the year 1912.

Irrigation is not equally necessary in all parts of California, neither can it be predicted from the annual rainfall. If grain were the only crop grown, but little irrigation would be required in the coastal or northern valleys of the interior valleys of the northern half of the State. Below San Francisco the necessity would increase, becoming absolute in the lower Sacramento Valley and most of the State south of Tehachapi. But even in the northern part of the State the rainfall occurs almost entirely during

the winter, which is the growing period, and during the rainless summer few plants can be grown without an artificial water supply, so that irrigation during the latter season is a distinct advantage in nearly every section of the State.

Northern California, or that portion of the State north of San Francisco, is divided into six irrigation zones: the coastal zone, the mountain valleys to the north, the mountain valleys to the east, a zone of high plateaus and valleys in the north-eastern corner of the State, the Sierra foothills on the western slope of the Sierra range, and the Sacramento Valley. The present extent of irrigated land and possible future developments are estimated as follows.

	Agricultural land — acres	Irrigated at present — acres	Total to be re- quired — acres
Coastal counties	502 200	2 675	104
North-central mountain valleys	435 000	103 850	25
North-eastern plateaus and valleys	867 000	161 930	34
Feather River valleys (mountain valleys)	158 000	50 600	10
Sierra foothills	789 000	45 250	20
Sacramento valley	3 449 000	123 500	250
Total	6 200 200	487 805	349
	100	7.9	

In a general way it may be said that the irrigated land in Northern California forms but a small percentage of the agricultural land and that a very abundant water supply which is used in a wasteful fashion is not used to the best advantage and with suitable storage, etc., the water resources of this section should be sufficient to increase the irrigated area 7.9 to 55.6 per cent. of the agricultural land.

Central California, or that part of the State south of San Francisco north of Tehachapi, is divided into four irrigation zones: the coastal zone, the large central valley of San Joaquin, the Sierra foothills on the western slope of the Sierra range and a high zone east of the Sierra range. The present extent of irrigated land and possible future developments are estimated as follows:

	Agricultural land	Irrigated at present	Total area to be eventually irrigated
	acres	acres	acres
al Valley	887 000	82 000	200 000
Joaquin Valley	7 576 000	1 728 975	3 850 000
foothills	730 000	10 620	50 000
east of the Sierra	472 000	137 760	200 000
Total	9 665 000	1 959 355	4 300 000
	100	20.3	44.5

In the coastal valley the water is not abundant and is further reduced by the fact that the cities take a heavy toll. Already one-third of the water used there for irrigation is pumped, and as valuable crops can be raised when water is available, considerable expense may be incurred in order to obtain it. On the whole, good use is made of the water supplies in central California, and future development will only take place by practicing the strictest water economy and, in the case of the coastal valley, by tapping the underground resources. In the high zone east of the Sierra Nevada the available water supply will be tapped by the Los Angeles aqueduct, now under construction, which will divert 430 cubic feet per second for Los Angeles and about Los Angeles.

Southern California, or that part of the State south of Santa Barbara and the Tehachapi Mountains, is divided into six irrigation zones, four of which are more or less coastal, the two others being the Colorado and Mojave rivers:

With regard to the coastal zones, Santa Barbara and Ventura Counties have not, up to the present, utilized their water resources as completely as other parts of Southern California, and the surface flow together with the underground supplies might serve to increase the irrigated area $6\frac{1}{2}$ times. Development in the Los Angeles and San Gabriel River zone will depend largely on the Los Angeles aqueduct, and in the two other coastal zones no large developments are likely to take place, as the supplies are already well developed. In the desert zones, the luxuriance of plant growth under irrigation is inevitably bringing about development, though the water resources are limited. Increased supplies will come in part from the Colorado River and in part from underground supplies.

Summarising: "The total area of irrigable land found in the zones of surface water supplies, which includes all of the valley lands, the rolling hills of the Great Valley, the arable portions of the Sierra foothills up to 3000 feet in elevation, and all of the plateau and desert lands to which

1532 PERMANENT IMPROVEMENTS. — DRAINAGE AND IRRIGATION

	Agricultural land — acres	Irrigated at present — acres	Total area to be eventually irrigated — acres
Santa Barbara and Ventura Counties . . .	509 250	49 656	322 5
Los Angeles and San Gabriel River lands .	441 986	167 454	381 5
Santa Anna River lands	876 671	213 407	279 0
San Diego County	363 668	19 880	87 1
Colorado Desert and River Valleys	1 550 750	279 600	766 9
Mojave Desert	2 328 000	15 489	113 0
Total . . .	6 070 325	745 486	1 949 8
	100	12.3	32

some irrigation water supplies are available, is 21 935 500 acres, of which 3 192 646 acres are already irrigated, and 9 699 600 acres are estimated to be ultimately irrigated."

The writer states that the results given above are largely statistical so that the estimates of areas ultimately to be irrigated can only be approximative. The 1912 investigation dealt chiefly with a detailed study of six typical irrigated areas which are fully described in the Bulletin. The writer repeatedly urges the absolute necessity of a general State control of all water supplies, for in that manner only can they be put to the best use and lead to a maximum development of agriculture in California.

1138 — *The Murrumbidgee Irrigation Scheme in New South Wales.* — *Journal of the Royal Society of Arts*, Vol. LXXI, No. 3168, pp. 873-875. London, August 3,

The soil of the so-called "chocolate" lands in the western part of New South Wales is extremely fertile, but up to the present owing to insufficient rainfall, the land has only been used for grazing sheep and cattle. As the outcome of the work of a Royal Commission, appointed thirty years ago, the State Government has begun work on a gigantic irrigation scheme in the Murrumbidgee River basin.

The waters of the Murrumbidgee are derived from the lofty table lands in the Eastern part of the colony where the rainfall amounts to from 70 in. per annum; the chief gathering ground is a basin 5 000 sq. miles in extent with only one outlet to the lower country through a deep gorge at a place called Burrinjuck. With a suitable dam here the most perfect natural reservoir is obtained, backing up the river for 41 miles and two

ant tributaries for 15 and 20 miles respectively, and forming a lake of an area of 29 square miles. "The dam is of Cyclopean concrete, 240 ft. at its maximum section, and 18 ft. wide at the top. The up-stream face is nearly vertical, being slightly battened down to the base. The down-stream face shows a curve concave to the down-stream to 60 ft. below the crest, so as to make the dam 36 ft. thick at that point. Then there is a curve of $1\frac{1}{2}$ to 1 for a depth of 90 ft., at which point the dam is 90 ft. thick. It then follows another curve in the same direction, for 50 ft. vertical, to a point 40 ft. above the base. From this point the face is vertical, and finishes 176 ft. from the inner toe of the foundation. In plan the dam will be 100 ft. in length along the crest, which is curved convex to up-stream to a radius of 1200 ft. The wall is being built up in a series of units, each representing the average quantity of concrete that can be placed in one day.

These units break joint in every direction, so as to imitate masonry construction and minimise defects due to remission of work."

The outlets consist of four 4 ft. 6 in. pipes, passing through the dam into the foundation, and controlled by valves, and two byewashes at the base, one at each side of the dam. The sides and bed of the gorge are of granite, and blocks of this are used for the concrete; sand is also obtained locally. The granite floor is irregular, so that the concrete masses key into the holes, thus preventing any possible movement under the pressure of the water.

The estimated cost of the dam, notwithstanding the high price of the labour, comes to about £ 750 000, which is roughly equivalent to £ 1 per acre of water held back; this is believed to be much less than the cost of similar work elsewhere; the Assuan dam, which holds up a maximum of 75 ft. of water, as against 230 ft. at Burrinjuck, cost £ 2 7s. per acre of stored water.

For 220 miles below Burrinjuck irrigation is not required; then a dike at Beremba, near Narandera, forms a convenient point for the diversion of the river. The main irrigation channel is 132 miles long and has a 134-mile branch, as well as distributing channels, and will serve to irrigate a block of land of 1 300 000 acres. At the point of diversion, a flow of 1000 cubic feet of water per second will be available. The main irrigation canal is 64 ft. wide at the water-level with a flow 8 ft. deep, equal to a present discharge of 1000 cubic ft. per second; this capacity will even be doubled. Distributing canals carry the water to each separate farm. Most of the farms on the area are designed for mixed farming and comprise 30 acres of irrigable land. Some, however, are smaller, while the cultural and workmen's blocks are narrowed down to 10 and 2 acres respectively.

The irrigation settlement will include three towns, about 400 miles from Sydney. These will be planned on modern lines, and will be provided with factories for the utilization of the produce. Roads will be made in such a way that no landowner will be more than a mile and a half from one.

The soils in the Murrumbidgee Valley are suited for irrigation, being loamy, deep, rich and friable. The natural drainage is such as to preclude any necessity for an artificial system. Analyses show that the soils contain an exceptional proportion of potash, and nodular limestone is abundant. The soil displays great bacteriological activity with rapid and vigorous nitrification. Mineral plant food is abundantly present.

All the land within the irrigation area is leasehold, and the lessees have to conform to conditions and regulations that are more or less inseparable from an undertaking that needs more co-operation than among the settlers in more ordinary circumstances. The conditions to be fulfilled are perpetual residence, payment of rent and balance of survey fees, and for value improvements, if any, on the land when applied for. The rent is at the rate of $2\frac{1}{2}$ per cent. per annum on the capital value. Farms are not transferable, with certain exceptions, until 5 years' residence has been completed.

As to the cost of water to the settler, it is fixed at 5s per acre- $\frac{1}{2}$ during the summer; this water rate is to be reduced by one half during the settler's first year of occupation, then increasing uniformly until the sixth year, when the 5s rate is required. The operations of farming on the area have now fairly started, and a certain amount of produce has been sent away to market.

The cost of the present scheme in round figures is approximately as follows: main works, £ 1 650 000; subsidiary channels, £250 000; cost of land, £ 1 000 000; total cost £ 3 300 000.

1139 - **Comparative Manuring Experiments with Crushed Phonolite and 40 per cent. Potash Salts.** — WAGNER, F. Düngungsversuche des Deutschen Hopfbauvereins mit Phonolithmehl (Kalksilikat) in Vergleich zu 40 % igem Kalisalz in den Jahren 1910-1912. — *Praktische Blätter für Pflanzenbau und Pflanzenschutz*, Year XI, No. 5, 6, pp. 52-53, 67-70, 77-82. Stuttgart, April-May-June 1913.

An account of three year experiments (1910-11-12) carried out at Geisenfeld, Bavaria, by the German Hop-Growers' Association ("Deutsches Hopfbauverein") at Geisenfeld, Bavaria. The hop garden which was site of the experiments was planted in 1908; the soil was humous sand (10 per cent. of fine soil), infertile and poor in potash (0.107 per cent. K_2O in air-dried fine soil). To a basis of sulphate of ammonia, basic slag and lime were added, for comparative purposes, the crushed phonolite prepared by the "Westdeutsche Eisenbahngesellschaft, Köln, Abteilung Steinbrüche am Rhein", and 40 per cent. potash salts. The crops of 1910 and 1911 were failures owing to reasons unconnected with the experiments.

In 1912 the experiments were recommenced on eighteen plots; in two there were 4 rows of 20 hills, and in six there were 4 rows of 10 hills. The first hill received 100 gms. ($3\frac{1}{2}$ oz.) of sulphate of ammonia, 150 gms. of basic slag (at 18 per cent. P_2O_5), and 100 gms. ($3\frac{1}{2}$ oz.) of lime as dressing. The potash manure was applied as follows.

plots 1, 7, 13: 284 gms. of phonolite at 9.87 per cent. potash = 28 gms. K_2O	
" 2, 8, 14: without potash	—
" 5, 9, 15: 60 gms. potash salts at 46.84 per cent. potash = 28 gms. "	
" 4, 10, 16: 142 gms. of phonolite	= 14 " "
" 5, 11, 17: without potash	—
" 6, 12, 18: 30 gms. of potash salts	= 14 " "

Reduced to acres, the results obtained in 1912 are from the financial point of view as shown in Table I.

TABLE I.

Amount of potash	Increase in crop due to the potash manure	Profit (hops at 74s 6d per cwt.)	Cost of ma- nure and of picking and drying extra crop	Net profit due to the potash manure
	cwt.	£ s	£ s	£ s
lbs. as potash salts (2 oz. per hill) 2794 per unit.	6.1	22 14	8 2	14 12
lbs. <i>id.</i> (1 oz. per hill) <i>id.</i>	3.7	13 17	4 17	9 0
lbs. as phonolite (10 oz. per hill) at per unit.	2.0	7 6	3 4	4 2
lbs. <i>id.</i> (3 oz. per hill) <i>id.</i>	0.7	2 15	1 6	1 9

The data respecting the quality of the hops in 1912 are given in Table II.

TABLE II.

Potash manure	Points for appearance, lupulin and aroma (3—15)	Commercial value	
		relative (minimum = 100)	absolute (per cwt.)
lbs. of potash as phonolite	9.25	101.0	105s
" " potash salt	9.75	102.5	106s 6d
" " phonolite	9.00	101.5	106s 6d
" " potash salt	10.00	105.0	109s
"	9.75	104.3	109s

1140 - The Sulphur Industry and Trade in the United States. — PHALLEN, W.
(U. S. Geological Survey) Sulphur Pyrite and Sulphuric Acid. — *The American
Miner*, Vol. XXXIX, No. 3, pp. 41-56 (41-47) Philadelphia, August 9, 1913.

The production of sulphur in the United States since 1880 is shown
the following table.

Production of sulphur in the United States, 1880-1912 in long tons.

Year	Quantity	Value
—	—	\$
1880.	536	21 000
1881.	536	21 000
1882.	536	21 000
1883.	893	27 000
1884.	446	12 000
1885.	638	17 875
1886.	2 232	75 000
1887.	2 679	100 000
1888.	—	—
1889.	402	7 850
1890.	—	—
1891.	1 071	39 600
1892.	2 400	80 640
1893.	1 071	42 000
1894.	446	20 000
1895.	1 607	42 000
1896.	4 696	87 200
1897.	2 031	45 590
1898.	1 071	32 960
1899.	4 313	107 500
1900.	3 147	88 100
1901.	241 691*	1 257 879
1902.	207 874*	947 089
1903.	233 127*	1 109 818
1904.	127 292	2 663 760
1905.	181 677	3 706 560
1906.	294 153	5 096 678
1907.	293 106	5 142 850
1908.	369 444	6 668 215
1909.	239 312	4 432 066
1910.	255 534	4 605 112
1911.	265 664	4 787 049
1912.	303 472	5 256 422

* Including the production of pyrite.

In determining the value of most of the sulphur produced in 191 current market price in New York was taken and the mine values computed from it. Prices remained fairly constant throughout the at \$ 22 to 22.50 per long ton for prime Louisiana sulphur.

Quotations on other sulphur per 100 lbs.

	\$	\$
Roller sulphur	1.85 to	2.15
Flour "	2.00	2.40
Sublimed "	2.20	2.60

Sulphur was produced chiefly in Louisiana, and in smaller quantities Nevada and Wyoming in 1912. The production of the individual States not be given without divulging confidential information. Utah, which produced on a small scale in previous years, reported no output in 1912. *Trade, Imports and Exports.* — The imports of sulphur during the five years are shown in the following table:

Sulphur imported and entered for consumption in the United States from 1908 to 1912, in long tons

	Crude		Flowers of sulphur		Refined		All other		Total Value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
	\$	\$	\$	\$	\$	\$	\$	\$	\$
1908	19 620	318 577	793	22 562	693	17 227	30	4 013	362 379
1909	28 800	492 962	770	23 084	966	26 021	53	7 565	549 632
1910	28 656	496 073	1 024	30 180	1 106	25 869	47	6 489	558 611
1911	24 200	434 796	3 891	83 491	985	24 906	68	9 643	552 836
1912	26 885	494 778	1 311	39 126	1 665	40 933	66	9 137	583 974

Crude sulphur imported from the following countries, from 1910 to 1912, in long tons.

Countries whence exported	1910		1911		1912	
	Quantity	Value	Quantity	Value	Quantity	Value
		\$		\$		\$
Spain	5	160	—	—	—	—
United Kingdom	7	199	11	248	—	—
France	10 704	201 993	8 031	156 157	2 348	46 003
Italy	17 377	283 232	16 185	279 991	24 505	447 946
Other countries	554	10 404	23	329	32	829

The exports during the last three years were as follows :

*Total exports of sulphur from the United States
from 1910 to 1912, in long tons.*

Year	Quantity	Value
1910	30 742	\$ 552 941
1911	28 103	545 420
1912	57 736	1 076 414

It is to be noted that in 1910 the sulphur production of the United States amounted to 3147 tons; the imports during that year were 167 696 tons which 166 285 were crude sulphur chiefly from Sicily. Thus the domestic production amounted to 1.84 per cent. of the sulphur consumed during the year, while in 1912 against a domestic production of 303 472 tons the imports amounted only to 29 927 tons, the domestic production constituting 91 per cent. of the consumption, and the imports less than 9 per cent. Moreover in the same year the excess of exports over imports amounted to 2 tons and the balance of trade in favour of the United States was \$ 499. The imports from Italy were only 8.7 per cent. of the total, while those from Japan amounted to 91 per cent. For the year 1912 it is estimated that the output of that country cannot be far from 40 000 tons, and it is believed that with the completion of the Panama Canal, United States sulphur will practically displace foreign sulphur on the Pacific Coast (California).

Further development. — Some new factors of the American sulphur industry are the foreign expansion of the Union Sulphur Co. of Louisiana and the new sulphur mines in Texas and in Wyoming.

The Union Sulphur Co. is reported to have negotiated with the authorities of Rotterdam (Holland) for the leasing for twenty-five years of a suitable tract of land having access to one of the harbours upon which to build a sulphur mill and other buildings. The city has offered a tract of land 330 × 420 feet with dock facilities on the Maas Haen, for which an annual rental of \$ 4200 is asked. The firm contemplates making Rotterdam its headquarters in Europe, and already a new refinery with grinding and storage facilities is being built. During 1912 the company is said to have acquired storage facilities at Hamburg (Germany). Besides these recent additions to its European distributing centres the company has refineries and storage plants at Marseilles and Cette in France. These plants will be supplied by the company's own fleet of ships, to which two new vessels were added in 1912.

In 1909 and 1911 the occurrence of sulphur near Bryan Heights at the mouth of Brazos River, in Brazoria County, Texas, was reported. At

g operations however were not begun till November 1912 by the Freeport Sulphur Co. The work has been somewhat intermittent owing to difficulties inherent in the beginning of an operation of this kind.

The sulphur is to be obtained by a process similar to that employed in Louisiana, that is the sulphur is melted in the ground by superheated water and is pumped to the surface by an air lift. Up to the middle of February seven wells had been sunk.

Bryan Heights is well located for the exploitation of the sulphur. It is 3 1/2 miles from the Freeport harbour. The detailed results of the operations have not yet been published, but it is reported that sulphur deposit was found at a depth varying between 900 and 1100 feet.

The sulphur beds themselves ranged in thickness from a few inches to 7 feet. Fuel oil will be used in the machines for raising the sulphur and it can be delivered at Freeport at a low cost.

Other sulphur deposits have been found in Wyoming, but it is still doubtful whether they can be utilized unless the local demand becomes

lastly the deposits of sulphur situated on White Island in the Bay of New Zealand may, prove of interest for the markets of the Pacific. Operations began on these deposits in April 1912 and the tonnage of sulphur mined in them is very large.

- Experiments on the Availability of Glucosamine Hydrochloride as a source of Nitrogen for the Nutrition of Corn (*Zea Mays*) and Beans (*Phaseolus multiflorus*). — HAMILTON, M. L. in *The Journal of the American Chemical Society*, Vol. XXXV, No. 8, pp 1046-1049. Easton, Pa., August 1913.

Two sets of experiments were carried out with 46 and 24 plants respectively, and showed that glucosamine could not be utilized as a source of nitrogen in plant nutrition, owing either directly to its own characteristics, or indirectly to conditions it may have caused, such as the growth of some mold which frequently appeared in the glucosamine solutions.

- New Selection Varieties from Alpine Forms of Fodder Grasses. — VON WEINBERGER, Th. in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 790-820, 2 figs., 10 plates. Vienna, July 1913.

I. INFLUENCE OF THE ALPINE CLIMATE ON PASTURE GRASSES.

Specific alpine plants show a number of the most varied and characteristic morphological and physiological modifications, which are to be attributed primarily to the effect of the alpine climate, and according to Nägeli should be regarded as "adaptation characters", in distinction from differences in organic characters which are not directly connected with adaptation to special circumstances, and are more constant.

The writer has for many years been carrying on experiments and studies in the Sandlingalp in the Northern Alps, at an altitude of 1400 m. (4700 ft.); he has shown that on the whole a number of the most valuable and important species of pasture grasses from the plains, and especially the wild

forms from higher ground, when grown under alpine conditions, gradually give rise to other forms differing in morphological and physiological characters from their valley-bred ancestors. The most interesting point, and one of greatest value from the agricultural standpoint, is that by means of continued selection, bearing on the most important characters for alpine plants (resistance to cold, yield of fodder, tillering, early development, etc.), these characters may be further intensified and prove constant under alpine conditions (sub-alpine vegetation region) even after 20 years' cultivation in this way new varieties of these cultivated plants may be raised.

When it is also taken into consideration that many of the parent plants dating from 1891 which have undergone this gradual transformation are still growing in the experiment garden on the Sandlingalp, it appears to the writer that his selection experiments with Gramineae may be regarded as further and conclusive proof of the truth of the theory advanced by Lamarck and upheld by C. von Naegeli, that environment has a direct effect upon the individual plant and that modifications arising through direct environmental influence are transmissible.

The persistence and transmission of these acquired characters has certainly resulted in all the forms of Gramineae obtained by the writer through selection; partly through mass selection and partly through line selection based on special forms and qualities.

The yearly increasing deviations in all the species and varieties occurred in the appearance of purple colour on the nodes, the leaf-sheaths and flowering glumes, and then in the increasing production of sterile shoots and enhanced tillering generally (*Bestockungszahl*) (1), larger number of leaves, increased breadth of the leaves, shortening of the internodes, also in the formation of special means of protection, as the waxy covering of the cocksfoot (*Dactylis glomerata*) and *Sanguisorba dodecandra*, the reduction of the serration of the leaves (*Bromus erectus* and *Deschampsia caespitosa*), finally a reduction of the vegetative period and displacement of the physiological phases in general.

In order to ascertain as far as possible the relations of the climatic influence to these alterations in the alpine grass forms, the most important factors of the alpine climate, viz. temperature, insolation, humidity of air, rainfall, and the chemical light intensity, were observed regularly during the vegetative period, and it was found that certain direct adaptations depend partly on single and partly on combined climatic factors.

It can be affirmed now that without doubt, chemical light intensity plays a very important part among the climatic factors of alpine distribution and that it directs the formative process of certain organisms of especially variable species, at all events during the earliest stage of their development giving the impetus to the characteristic laying down and the later shaping of the leaves and stem, that is of the sheath and blade in the one case,

(1) The writer understands by this 'the number of sterile shoots to every culm of individual plant. Translated lower down as "tillering value".'

ternodes in the other. The shortening of the latter leads necessarily more tufted habit, owing to the side shoots being thereby brought to the main stem; this is shown by most Gramineae cultivated under influence of the alpine climate.

THE MOST IMPORTANT ALPINE VARIETIES SELECTED FROM PLANTS
FROM THE PLAIN.

The writer has bred the following new varieties:

1. *Agropyrum caninum* Schreb.: a variety bred from the wild form of plain; it resembles Italian ryegrass, but is a persistent fodder grass (especially adapted for alpine green soiling mixtures and alpine meadows).

2. *Arrhenatherum elatius* Mert. et Koch: very suitable for alpine meadows; selected from wild forms.

3. *Arrhenatherum* var. *bulbosum* Koch: a variety well adapted for alpine meadows, selected from wild forms.

4. *Avena pubescens* Huds: persistent, leafy variety, bred from wild mountain forms.

5. *Dactylis glomerata* L.: alpine form with bloom-covered leaves; derived from wild mountain plants; resistant to rain (ombrophilous).

6. *Festuca arundinacea* Schreb.: alpine form with the typical characteristics; cold resistant even at high altitudes; leaves soft; very productive, especially suitable for alpine meadows.

7. *Festuca pratensis* Huds.: from wild plants, coming from mountain meadows; a very productive and persistent alpine selected variety.

8. *Festuca rubra* var. *fallax* Hack.: from this tufted variety of *Festuca rubra*, an alpine form was bred with purple nodes and variegated outer sheaths; it has soft culms and narrow leaves, is cold-resistant and very productive.

9. *Lolium perenne* L.: a persistent alpine form with purple nodes, and reddish, purplish leaf-sheaths; selected from wild individuals growing on the mountains.

10. *Phleum medium* Brügger: a very productive alpine form adapted for meadows and pastures.

Finally we must mention a little-known fodder plant grown by the writer in his alpine experiment garden:

11. *Sanguisorba dodecandra* Mor.: from Val Ambria, Southern Switzerland; the alpine form has bloom-covered leaves and reddish-violet petioles and stems; it is a cold-resistant green crop for the Alps, especially useful when mixed with the alpine form of *Agropyrum caninum*, and has a great future for it.

Special mention should be made of some species of plantain grown by the writer on the Sandlingalp and subjected to further selection on the Kragl Alp during the last three years; of these the most important is *Plantago media*, an excellent pasture plant of tufted growth; many varieties have arisen during cultivation at lower altitudes. These will be dealt with by the writer in a later paper.

III. BEHAVIOUR OF ALPINE FORMS (ACCLIMATISATION RACES) WHEN CULTIVATED AT LOWER ALTITUDES.

The writer has grown these alpine selection varieties under more favourable vegetative conditions, viz, in more sheltered and sunny spots in order to obtain more seed than could be hoped for, especially in ripening varieties at an altitude of over 1400 metres.

On the establishment of the Kragl farm (under the writer's direction) in 1908, selection experiments were begun by means of sowing the seed of the required alpine forms and pricking out selected plants, of at least two years of age, from the Sandlingalp garden. Kragl was instituted merely as a modern pasture-farm for the furtherance of cattle-breeding interests, but primarily to serve in the promotion of botanical research, the seed selection of fodder plants.

The selection garden there lies some 820 m. (2700 ft.) above sea level. It was formerly a State nursery for forest trees, so that the ground was suitable for such experiments without the repeated working necessary in the case of the Sandlingalp. The composition of the soil and the manure used were the same as in the alpine experiment garden.

The following important facts are shown by the elaborate tables compiled by the writer respecting the development through further selection of the forms obtained at Kragl, as compared with the alpine selection varieties.

1. In general, the number of culms per individual is considerably increased in the varieties which have been further cultivated than in the parent alpine forms, while the number of leafy shoots (and therefore the tillering value) has decreased, with the exception of *Festuca rubra fallax*, *Poa serotina*, and *Phleum Michelii*, in which the tillering value is higher.

If the number of the culms and leafy shoots of the parent alpine varieties be taken as 1, the following series represents the proportional number in the varieties which have been further cultivated.

	Culms	Leafy shoots
<i>Festuca pratensis</i>	6.38	0.66
" <i>arundinacea</i>	6.25	0.40
<i>Agropyrum caninum</i>	5.67	0.25
<i>Phleum Michelii</i>	4.12	1.63
" <i>medium</i>	1.82	0.56
<i>Poa serotina</i>	1.80	1.80
<i>Festuca rubra</i>	1.17	0.86
" " <i>fallax</i>	1.07	1.56

2. A remarkable character of all these varieties under further cultivation is the greatly increased yield of seed, which in *Festuca arundinacea* is twenty-four times as much as in the parent alpine form.

In correlation with this is the increase in the number of spikelets per individual in the new varieties.

3. In like manner the fodder yield increases in the case of the new variety, though not to the same extent as the extra seed production; in the selected variety of *Festuca pratensis* it reaches more than ten times as much as that of the parent form.
4. If, as in the case of the number of culms and leafy shoots, 1 is taken as the yield of the parent alpine form per unit area, we get the following results for the seed and fodder production of the new kinds. These tables clearly demonstrate the superiority of the latter, not only over their parent, but also in comparison with the commercial varieties. A comparison between the two tables further shows that the highest seed yield does coincide with the largest fodder production.

Seed yield of the selected varieties.

	Kragl selected variety	Commercial or original variety
<i>Festuca arundinacea</i> . . .	23.9	4.4
" <i>rubra fallax</i> . . .	16.6	5.5
<i>Agropyrum caninum</i> . . .	11.2	—
<i>Phleum medium</i> . . .	9.3	5.7
<i>Festuca rubra</i>	7.1	3.1
<i>Phleum Michelii</i> . . .	6.7	1.1
<i>Festuca pratensis</i> . . .	3.9	1.4
<i>Poa serotina</i>	2.7	1.8

(Yield of parent alpine form at the Sandlingalp = 1).

Fodder yield of the selected varieties.

	Kragl selected variety
<i>Festuca pratensis</i> . . .	11.8
" <i>arundinacea</i> . . .	8.3
<i>Agropyrum caninum</i> . . .	3.6
<i>Poa serotina</i>	2.6
<i>Phleum medium</i> . . .	2.2
" <i>Michelii</i> . . .	2.2
<i>Festuca rubra</i>	1.5
" <i>fallax</i> . . .	1.3

(Yield of parent alpine form at the Sandlingalp = 1).

The new varieties retained their acquired characters for three generations during further selection and multiplication, and these modifications became intensified. These facts have been determined by the experiments of practical breeders.

IV. THE PRINCIPAL RESULTS OF THIS WORK.

These may be summed up under three heads:

1. During the further cultivation, in sheltered, sunny spots in the mountains, of alpine forms bred under the influence of the alpine climate

from lowland grasses, new forms again arise ; from these can be bred varieties which are not only far more productive than their parent alpine forms, but are also superior to the best kinds in use or in the trade.

2. The superiority of these varieties is chiefly shown by their seed yield. Thus, the further cultivated form of *Festuca arundinacea* in the third generation bears 23 times as much seed as its alpine parent. The further cultivated varieties have, as a rule, also exceeded their alpine parents in fodder production.

3. Experience shows that the seed production of all cultivated varieties decreases considerably, normally in their fourth year, and this falling off also occurs in the case of the new selection varieties ; to obtain a larger and purer seed yield it is therefore necessary to renew the multiplication plots after some years by either transplanting or sowing new selected seed from the lowland selection garden ; the latter must also be restocked with the varieties in question taken from the first selection ground, i. e. the alpine experience garden. This entails a new and important interrelation between the alpine seed-breeding garden and the further cultivation of the alpine varieties in lower places, and also manifests the importance of the alpine seed-garden for the cultivation of fodder in valley farms.

If the data so far obtained do not permit of a decisive opinion being formed, especially as regards the lasting worth of the new selected varieties, they are yet not to be despised, for they open up a new field of work for both scientific research and practical agriculture.

1143 - Selection of Pigeon-Pea or Rahar (*Cajanus indicus*). — SM, S. Improvement of Rahar by Selection. — *The Agricultural Journal of the Department of Agriculture, Bihar and Orissa*, Vol. I, No. 1, pp. 25-29 + 4 plates. Patna, April 1912.

Rahar is held in high esteem as a food in India. Its seed coats, young shoots and leaves make excellent fodder for cattle ; its branches are used for roofing, basket and thatch work and the dried stalks for fuel. Its obvious importance in the rural economy of the natives makes this phase worthy of study and improvement.

Observations were commenced on Sabour Farm in 1908 with a Sabour variety. It was noticed that considerable variation existed among the plants with respect to the following important characters : growth, mark and colour of the plant, plumpness of pod, colour and size of grains and character of the flower. The variations were recorded as follows :

- A. Habit of growth : 1) erect, 2) spreading.
- B. Colour of pods : 1) violet, 2) white, 3) striped.
- C. Fullness of pod : 1) inflated, 2) wrinkled.
- D. Colour of seed coat : 1) reddish-brown, 2) white, 3) black.
- 4) spotted.
- E. Size of grains : 1) large seeded, 2) small seeded.
- F. Flower characteristics : 1) standard yellow, 2) standard yellow with red veins.

Among all the multitudinous forms possessing these characters, the

observed a certain degree of correlation. He found the following related characters:

1. Erect type with large grains and entire-coloured pods.
2. Spreading type with small grains and striped pods.
3. Erectness in form with lateness of maturity.
4. Wrinkledness of pod with roundness of grain.
5. Spotted grains with extreme earliness.

Attempts at selection were also made with respect to earliness, wilt resistance and west-wind resistance. Selection work during two seasons produced the following results: 1) Early plants have a low spreading habit, the foliage and fruits small. 2) No morphological character appeared to be correlated with wilt resistance. 3) The thick-podded erect forms are generally more resistant to the west wind. 4) Large pods and seeds are associated with the erect habit of growth.

In the field trials the erect form was always found to be superior to the spreading form; it is now being grown as a general field crop at Sabour.

- Comparative Experiments on Red Clover of Different Origins at the Svalöf Institute during 1907 to 1912. — WITTE, H. in *Sveriges Utsädesföreläringar* vol. 11, p. 11.

Most of the red clover seed imported into Sweden is described as "Silesian," a small quantity as "Russian." The former brand includes not only seed from Silesia and neighbouring countries, but also that of Hungary, France, Italy, North America and Chile. Only the varieties resistant to a cold winter are of use in this country, and for the pastures of 6 years duration, which is the usual system in Sweden except the northern portion, a very hardy and persistent clover is required. Experience has shown that imported clovers vary considerably with respect to their earliness and persistence, and this has been verified by the experiments conducted at the Svalöf Institute during 1907-12.

Most of the foreign varieties are early in maturity and characterised by erect slightly-branched stems and an early secondary growth, which allows two cuttings to be obtained; but they are of so short duration that the second year's crop is very small.

The largest yields have been obtained from seed from Silesia. Posen, Prussia, Bohemia, the Rhenish Palatinate and Galicia, and often the second year's crop has been as large as the first. Moravian seed is somewhat inferior and that of Austria (with the exception of the Austrian countries already named) suffered very badly in the winter. Russian seed was better than the Silesian. The Swiss variety "Matten Klee" gave a poor crop owing to its earliness and tenderness. The American varieties of the spreading type have all given inferior yields, but their hardiness varied according to the latitude of their origin. The Italian, Brabant, and above all the English and Chilean clovers, were lacking in hardiness and durability. The late varieties from England and Bohemia matured early but developed somewhat slower than the true Silesian clover.

The late variety, with tall much-branched stems, generally gives only a small yield aftermath, but its total yield for the first year is equal to that of

the early variety; in the second year, in which it gives its biggest crop it considerably exceeds it. Owing to its persistence (it will last five years) this variety is the only one suitable for pastures of long duration.

Most of the Swedish varieties were of this type, as also were those from Norway, Finland and North Russia. The foreign varieties, with the exception of those of Finland, were generally inferior to those of Swedish origin. These native varieties showed considerable differences in the periods of flowering and yields, the latter character being generally related to their lateness.

1145 — **Manuring Experiments on Alpine Pastures in Carinthia: 1910, 1911, 1912.** — Svosova, H., of the Laboratory of the Institute for Research and the Education of Foodstuffs of the Duchy of Carinthia at Klagenfurt. — *Zeitschrift für Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 7, pp. 745-749, Vienna July 1913.

The results of this work and of two previous reports are given together as follows:

1. The soils of all the alps experimented upon were very poor in P, K₂O and CaO. In 100 gms. of air-dried fine earth there were only in 40 more than 0.1 gm of P₂O₅. The other eight soils contained considerably more than 0.1 per cent of P₂O₅, namely 0.003, 0.008, 0.017, 0.019 per cent. The potash content of all the twelve soils was under 0.1 per cent., with a minimum of 0.024 per cent. Only two soils contained more than 1 per cent of CaO, one upwards of 0.3 per cent, one over 0.2 per cent., five between 0.1 and 0.2 per cent., three under 0.1 per cent.

2. Tilling the Alpine soil gave everywhere good results; no soil can naturally be more benefited by physical improvement than Alpine soil.

3. In two of the experiments the same fact was observed: that in laying down a new ley on an alp after breaking up the old turf, the grass seeds sown did not sprout unless they were abundantly manured with stable yard manure or chemicals. After broadcasting, the grasses did not develop sufficiently to form the new turf till three and four years, according to the altitude. The vegetation obtained at last was poor and was composed chiefly of weeds, *Aira* and *Nardus stricta*.

4. With one single manuring of farmyard manure (St) or chemical alone (K), or of a mixture of both (K + St) the average crop of hay was following during the first five years, in cwt. per acre.

Manures	1908	1909	1910	1911	1912
Unmanured	7.71	8.76	14.01	19.59	1
St	17.44	20.72	19.20	20.89	1
K	18.56	14.30	19.75	27.92	1
K + St	23.34	23.97	21.33	28.11	1

The crops from the unmanured plots are light on account of the improved state of the soil. Reckoning them at 100 the increases due to the manures are given below.

Year	Stable manure	Chemical manures	Stable and chemical manure
1891	2 to 2 ¹ / ₈ times as much	2 ¹ / ₈ to 2 ¹ / ₂ times as much	fully 3 times as much
1892	"	100 : 150 to 160	2 ³ / ₈ times as much
1893	100 : 137	100 : 142	100 : 152
1894	100 : 106	100 : 142	100 : 143
1895	100 : 116	100 : 142	100 : 138

In some cases the writer observed extraordinary increases of the crop, such as 4 to 7 times the amount from the unmanured plots. The results of the various years confirm each other satisfactorily.

The effect of the stable manure during the first and third years was equal to that of the chemicals, and in the second year even better, but in the fourth and fifth years it was considerably inferior and barely noticeable. The combination of stable and chemical manures had the best results and during the three years was superior to that of the other manures applied separately; in the two last years however it was of equal value to the artificials. The considerably longer duration of the after effects of artificials as compared with farmyard manure is proved beyond all doubt. The after effects of stable manure lasted about three years, those of artificials about two.

Only after this period did the increase of crop due to artificials begin to be noticed on some of the alps.

For the practical Alpine farmer—as in general for all farmers—the combination of farmyard and chemical manures is advisable.

5. Respecting the water content of green forage and the ratio between the dry substance in hay the writer noticed variations ranging from 60.4 per cent. of hay in the green forage, while the hay contained 80.3 to 90.1 per cent. of dry matter. The plots that gave the lowest yield, thus the unmanured and the St. plots, gave the driest green forage, the heavier bearing plots (K and K + St) the richest in water, there being a sort of compensation in the higher hay and dry substance content of the smaller crop. On the other hand the quality of the dry straw-like material of the poorer plots is naturally inferior to that of the juicy forage of the good Alpine meadows, which is always richer in protein. In general it may be said, with the increasing yield of a plot the water content of the crop increases and this may be explained by the fact that the drying effect of the sun is not so powerful on a dense vegetation as on a thin and dry one.

Level Alpine meadows bear much more abundantly than those situated on slopes, which is to a certain extent due to the lesser leaching out of food from the humus and washing away of the fine earth and to the circumstance that the slopes in some aspects, are exposed to a more intense action of the sun.

The writer mentions another observation made elsewhere: the analysis of three samples of grass which was cut on August 22, 1912, near Mollath at different altitudes above sea level:

Height above sea level . . .	7 710 ft.	6 725 ft.	5 905 ft.
	per cent	per cent	per cent
Crude protein	17.90	15.90	12.90
Crude fat	2.62	2.64	1.84
Ash	8.34	6.62	9.58

From the above it would appear that the protein content increases with increase of altitude; this question is sufficiently interesting to deserve to be more closely studied and on more ample material.

6. The sowing of good forage grasses and clovers on Alpine meadows is a measure strongly to be recommended. In the above-mentioned experiments timothy and dog's-tail proved to be the best grasses; they are of slow growth both on limestone and on primary rocks. Fox-tail, yellow and alsike clover grew luxuriantly the first year after sowing, but then their growth slackened and they even disappeared completely. In order to prevent this disappearance it is necessary, after the first initial manuring, to repeat every year the application of animal and mineral fertilizers, for already after four or five years, areas which presented a quite different botanical population, lose the best sorts of grasses, get invaded by weeds and end by being covered with the same plants, generally of a poor description.

7. The use on the alps of the best possible artificials, notwithstanding the high cost of transport, which by suitable measures may be reduced, is in the end the most profitable course to pursue, owing to the great increase of crops which they cause and to the length of time which their after effects extend.

1146 - *Desmodium hirtum*, Leguminous Forage Plant Recommended for the Prevention of the Development of Weeds and as Green Manure Tropical Plants. — STOLZ, A. and HARMS, H. in *Der Tropenpflanzer*, Year 17, No. 430-437. Berlin, August 1913.

This plant is an addition to the number of nitrogen-bringing green manure plants, which grow rapidly forming a dense cover, capable of preventing the development of weeds and of protecting the soil against leaching by torrential rains and the heat of the tropical sun.

The habitat of *Desmodium hirtum* (Guill. et Perr.) is fairly extensive; it is found in Natal, German East Africa, Senegambia, Sierra Leone, Togo, Kamerun. It grows from sea level up to an elevation of about 5 600 ft. It is a herbaceous climbing plant, the branches attaining a length of:

It. In German East Africa the plant loses its leaves in July and August and many of the branches die, but in September vegetation starts, new branches cover those that have died and which go to form an excellent humus.

The production of the seeds is not very easy, consequently the writers recommend the following method. The seeds are sown in a rich, loose, fresh soil, the seedlings are transplanted when about 4 inches high into loose soil, vigorous plants are obtained which produce numerous cuttings. The writers insist on the necessity of taking only rooted cuttings, and they choose a rainy season for making a plantation and setting the trees 3 ft. apart.

This *Desmodium* is very sensible to the physical state of the soil; it has a decided preference for tilled soils and develops much more in plantations than in the wild state.

In a rich soil this leguminous plant forms a cover one foot deep which completely prevents the growth of weeds and thus allows a great saving of hoeing; besides this, *Desmodium* may be utilized as green manure and as food for live stock, sheep and asses being especially fond of it.

- **Cotton Problems in Louisiana.** — COOK, O. F. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular No. 130*, pp. 3-14. Washington, June 21, 1913.

The production of cotton in Louisiana is at present traversing a crisis which the chief causes are the following:

1. — The higher cost of farm labour and the difficulty of finding sufficient hands for picking due to the double exodus to the cities and towns to Texas.
2. — The boll weevil finds here specially favourable conditions: the prevalence of late maturing varieties of cotton, the great luxuriance of vegetation, the great extent of wooded country, affording unusual facilities for the hibernation of the insect.
3. — The tendency of the cotton industry to replace the long stapled cottons by short staples is injurious to the lower Mississippi Valley (Louisiana and Mississippi) which produces the best Upland long-staple of all the cotton belt.
4. — The introduction of large public gins instead of the old separate plantation gins had led:

a) to a mixture of seeds rendering it difficult to secure supplies of clean seed;

b) to a mixture of various cottons injurious to the quality of the fibre causing complaints on the part of the buyers.

The writer studies the means of improving this state of things.

1. — Control of the boll weevil: a) promoting scientific research with object of obtaining long-staple *early* varieties and testing the methods of cultivation calculated to increase this quality (root-pruning, closer planting, etc.); b) organizing communities of planters for the collective con-

trod of the insect, which is the only efficient means of obtaining practical results.

2. — *Improvement of the quality* of the produce by means of these groups of planters, who should rigorously select their seed and strive for a *single* product.

3. — *Education of the consumer.* The improvements of spinning machinery have made it possible to spin short cotton and produce fabrics *comparable* to those previously made from long staples. But the short-staple fabrics are undoubtedly inferior in strength and durability to the long-staple ones. As this change is against the interests of the consumer as well as the planter of long-staple cottons, and profitable only to the spinner, public should be illuminated on the subject.

4. Lastly the writer proposes the acclimatization into Louisiana of *tropical* crops, so that cotton may become a branch of a *safer* and *diversified* system of agriculture, which would be especially advantageous for the better utilization of labour.

1148 — **Cotton in India.** — SCHANTZ, MAURICE in *Beishefte zum Tropenpflanzer*, Vol. No. 5-6, pp. 439-609, Berlin, August 1913.

This article supplements the monographs already published on Cotton Cultivation in the United States and Egypt.

Historical. — The author outlines the history of cotton cultivation from 800 B. C. Table I shows the effect of the War of Secession in 1861 on the production of Indian cotton.

TABLE I.

Year	Exports	
	Quantity	Value
	tons	millions sterling
1860	170 300	7.3
1861	176 400	10.0
1862	211 100	18.5
1863	245 600	35.1
1864	234 400	36.8
1865	358 350	34.9
1866	189 950	16.2
1867	274 150	19.7
1871	361 250	20.9
1878	148 300	7.7

Many attempts have been made to improve the quality of this fibre the results are now being felt. In particular the author mentions the of the Cotton Supply Association, the British Cotton Growing Association, the International Federation of Master Cotton Spinners' and Manufacturers' Associations, and the Indian Government.

Soils. — In India the three great cotton areas correspond to three great geological formations. 1) The northern zone comprising the alluvial soils of the Bundelkand and the valleys of the Indus and Ganges, which vary from the sands of Sind and the Punjab to the clays of the United Provinces. The middle zone extending from Rajputana to the Dekkan consists of the famous "Regar" or Black Cotton Soil, the richest soil in India. The Southern zone consists of a soil of crystalline origin and comprising ferruginous, red and yellow lands. The "Regar" soil is also found in the Southern zone, particularly in the districts of Tinnevely and Coimbatore.

Climate. — Owing to the monsoons, India receives 90 per cent. of its rainfall during the summer or south-west monsoon. The distribution of rainfall is very irregular, causing thereby the proverbial famines of dry seasons; the mean annual rainfall varies from 23 cm. to 358 cm. in the various provinces. When there is not enough rain the cotton has to be irrigated. The Government has been much concerned with this question and has repaired the old canals and constructed new ones, so that in March 1912 the total length of these canals reached 58 000 miles.

Geographical Distribution. — Cotton is cultivated to some extent throughout India. In Berar one-third of the cultivated lands is given up to cotton, in Bombay 10 per cent., in Madras $5\frac{1}{2}$ per cent., Central Provinces 10 per cent., North-West Provinces 4 per cent. Sind $3\frac{1}{2}$ per cent., and the Punjab $2\frac{1}{2}$ per cent. This shows the relative importance of this crop in each province, while the following figures show the distribution of cotton areas in the different provinces.

Provinces	per cent.
Bombay	28
Central Provinces and Berar	22.5
Haiderabad	13.9
Madras	8.4
Punjab	8
United Provinces	6.2
Central Provinces	4.4
Baroda	3.1
Rajputana	2.1
Other provinces	3.4

100

Species cultivated in India. — The writer has divided the different indigenous varieties into three groups: *Gossypium arboreum*, *G. nanking*,

and *G. obtusifolium*. The exotic varieties which have been introduced more or less success are divided into two groups according to the appearance of the seed, thus: a) with covered seeds - *Gossypium hirsutum* (Upland) b) with naked seeds - *G. purpureum*, *G. trilobatum* and *G. brasiliense*.

Commercial varieties. — Table III gives a résumé of the characteristics of Indian cottons.

TABLE III.

Name	Colour and appearance	Length mm.	Diameter mm.
Oomras	white-cream, silky	—	—
Khandesh	dirty	10-16	1/16
Berar type	clean	10-25	1/16
Berar special good staple	clean	20-30	1/16
Dholeras	white, silky	15-25	1/16
Broach	white, silky, clean	16-26	1/16
Broach Surtee	very beautiful white, silky	20-30	1/16
Bengal	white mixed with yellow flecks	13-16	1/16
Sind	clean, yellowish white	13-16	1/16
Punjab	white, half silky	17-22	1/16
Assam	white, very clean and short.	10-13	1/16
Burma	white to khaki.	13-16	1/16
Kumtias	yellowish brown, silky	19-22	1/16
Dharwar American	beautiful white, silky	16-20	1/16
Westerns	white to yellow, very dirty	20-24	1/16
Northerns	deep yellow to red.	20-24	1/16
Cocanadas	reddish brown to white	20-24	1/16
Tinnevely	white to cream, strong, silky	23	1/16

From the point of view of quantity, Oomras are the most important representing almost half the production of India. The best quality is the Broach, followed by Dharwar; Sindhs and Punjabis resemble Bengal varieties which constitute the lower grades; whilst the Oomras are of average quality.

Area under cotton and yield. — The areas and yields of the various Provinces are given in Table IV.

TABLE IV.

Province	Area under cotton in thousands of acres	Yield in thousands of bales (400 lbs.)
Algeria	5 932	1 302
Algerian Provinces and Berar	4 523	910
Assam	2 426	317
Bahar	1 575	346
Bengal Provinces	1 148	425
Bombay	288	121
Burma	227	45
Canton	89	19
Central and Eastern Bengal	86	31
Central Provinces	55	13
Central and Marwar	51	20
Coastal	2 888	300
Colonial Provinces	1 314	206
Cyprus	762	196
France	393	127
Germany	154	19

Whilst the yield per acre for the United States is 175 to 215 lbs. and of Egypt 340, it is only 100 for India.

The yield varies considerably from the South to the North, where it is least. Table IV shows this variation and the effect of irrigation.

Yield of lint. — The quantity of lint amounts to about one-third of the weight of the crop; this proportion varies from about 25 per cent. for Rozzi to about 41 per cent. for Comilla.

TABLE V. — *Yield of cotton in lbs. per acre.*

Province	With irrigation	Without irrigation
Sindh	308	—
Ajmir and Marwar	—	192
Berar	—	144
United Provinces	190	130
Bombay	—	100
Punjab	109	80
Upper Burma	—	80
North-West Provinces	183	72
Bengal	—	75
Central Provinces	—	75
Mysore	—	52
Madras	—	45

Seeds. — The ratio by weight of the seeds to the fibre is about 7. Apart from their use for sowing they are largely used for feeding on the spot (4 to 5 lbs. a day). The exports from Bombay for feeding are increasing each year.

Year	Exports of Cotton Seed
1897-98	28 360 cwt.
1900-01	225 000 "
1910	6 000 000 "

Cultivation — The cotton plantations are not in the hands of European planters, the crop being grown by the inhabitants. Sindh and Madras are the only Provinces in which the perennial species are still grown. The seeds, often mixed with other grains, are generally sown broadcast in Central and United Provinces, Berar and the Punjab.

A rotation is practised consisting of wheat, millet, oleaginous and leguminous plants. About 10 lbs. of seed is sown per acre. Sowing is usually in June, but there is probably not a month in the year in which sowing does not take place in some part of India. The growing period is similar but variable. The Oomra variety matures in 4 or 5 months, whilst the Broach requires 8 months. The first picking generally gives the best quality and the second the greatest quantity, whilst the third is inferior in both quality and quantity.

There is not the same uniformity in production of cotton in India as there is in Egypt and the United States, so that the writer studies different districts in detail.

Principal Cotton Centres.

1. *Punjab.* — The soil is generally alluvial or sandy, and owing to the rainfall of 600 mm. (150 to 180 mm in the West) the cotton crop receives irrigation. The canals are well developed and irrigate about seven million acres. The Chenab canal, the greatest in India, has transformed what was 70 years ago an arid desert near Lyallpur, into a fertile region. Most of this land is held by small owners (with 4 to 6 acres) who apply the principles of modern agriculture, and the yield is considerably greater in this district than in most of the regions of India.

2. *Bombay Presidency.* — a) *Sindh.* — This district resembles Egypt, being a desert traversed by a river and a fertile valley. The mean rainfall being only 180 mm., irrigation is indispensable; cotton is limited to the districts of Haiderabad, Thar and Parkar, where irrigation is possible. The inhabitants cultivate only a third or even a fifth of their land, the remainder allowing the land to be fallow for 5 years.

On the hill lands the Sailabi method is practised: first irrigation, then frequent follow-up irrigations, because the soil does not retain the water. The Bosi method is applied to the inundated area which is not irrigated after the sowing.

Since 1852, numerous experiments have been made to introduce varieties having a longer staple, but disease and atmospheric conditions have been unfavourable to their success. The experiments have shown that when the irrigation canals are finished, it will be possible to cultivate varieties of cotton such as Mitafifi, which, with careful harvesting and preparation, will equal the "fully good fair brown," Egyptian. This would yield a profit of 60 rupees (80s) per acre in place of the 42 (57s) which is obtained in Sindh under the same conditions. It is also hoped that similar success will be obtained with the Upland, which required only 12 to 13 irrigations in place of 22 required by Mitafifi.

b) *Gujerat North or Kaira-Ahmedabad.* — A sandy soil with a rainfall of 40 to 950 mm. produces a yield of raw cotton (variety Dholera) of 200 lbs. per acre without irrigation, and up to 1200 lbs. with irrigation. Most of the crop goes to the spinning mills of Ahmedabad.

c) *Gujerat South* — The famous variety Surtee Broach originated here. It is the best native variety, but Surat Deschi Broach is the most valued. The soil is a black clay, only tillable after the rains, which amount to 50 or 1150 mm. per annum. Irrigation is not practised; the people are intelligent and the system of cultivation is the best in India.

d) *Deccan of Bombay.* — This supplies most of the Bombay requirements. It has a clay soil and a mean rainfall of 700 mm. Cotton is the principal product of the North and the variety Oomras is mostly grown.

e) *Mahratta South or Karmatak.* — This region comprises the southern portion of the Bombay Presidency. About 600,000 acres are given up to cotton and two varieties are cultivated: 1) Kumptas, giving 300 to 400 lbs. of raw cotton with a yield of 25 to 29 per cent. of lint, is a variety of which there is a tendency to substitute for it the true Broach which yields 100 lbs. p. acre, containing 34 per cent. of lint, with a market value

12 per cent. higher; 2) American Dharwar; this variety has degenerated and is being replaced by Cambodian.

3. *United Provinces.*—The western portion (Agra), which is well watered all the year, is the most important for cotton. About one-third is irrigated and the remainder receives an annual rainfall of only 820 mm. Some of the land is held by small owners in plots of 5 to 10 acres. The variety cultivated is Bengalee. Attempts to introduce varieties of long staple have been unsuccessful.

4. *Central Provinces and Berar.*—This is the centre of the cotton cultivation of India, and cotton here ranks second in importance in the textile trade. Three principal varieties are cultivated: a) Bani, one of the most beautiful cottons of India with a length of staple from 25 to 28 mm., it can be spun up to No. 40; it is being abandoned, an account of its low yield of lint (26 to 27 per cent) in favour of the more productive; b) Berar Jari; this variety yields 35 per cent of lint, is very popular in the market on account of its woolly appearance, and is used in the manufacture of "Vicuna" cloth. It is a mixture of about 65 different varieties, among which are *G. malvensis*, *G. vera*, *G. rosea*, *G. rosea cutchia* and Bani. c) Berar a Georgia-Upland variety obtained at Calcutta and the most hopeful of all the exotic varieties tried.

The most important cotton region is the valley of Payanghat, where the best product is obtained and 40 per cent. of the arable land is reserved for this crop. The rainfall varies from 750 to 1250 mm., and it is generally not necessary to irrigate. The methods of cultivation are quite primitive; cracking of the clay soil during the dry season takes the place of cultivation. Sowing takes place in June and the crop is harvested in October, as from November onwards the drought induces tearing of the roots.

5. *Madras Presidency.*—The annual rainfall is 700 to 760 mm. for Tinnevely, 630 mm. for Coimbatore and 480 to 540 for Bellary; this is not adequate and requires to be augmented by irrigation. The varieties cultivated are: a) Uppams, sown in May and July on the black cotton soil; consist of about 8 different varieties, and are grown chiefly in the North of Tinnevely and the south of Madoura. b) Nadam or Ladam, a perennial variety sown in September and November in red sandy soils; produces the cotton known as "cocanadas". c) Tellapatti (Uppam × Bour) yields Westerns (Bellary and Karnul) and Northern (Tadpatti) types. d) Salems, a mixture of Uppams, Ladams, and Bourbon, met with in Coimbatore. e) Cambodian has made rapid progress:

Years	1908	1909	1910	1911	1912
bales of 500 lbs.	40	1 650	7 500	30 000	80 000

On land manured and irrigated it gives 1250 to 1600 lbs. of raw cotton per acre, with a yield of 33 to 35 per cent. of lint; whilst the native variety gives 60 to 100 lbs. of lint, Cambodian reaches 500 and more, and the introduction fetches 1d a lb. more.

Exports. — Cotton is an important factor in Indian commerce. In 1912 its export reached the value of 406 million rupees (27 millions sterling) made up as follows.

	Value in thousands of rupees.
Raw Cotton	293 341
Seed	15 191
Thread	75 901
Goods in bales	19 666
Shawls and handkerchiefs	1 525
Various	695
	<hr/> 406 319

The article concludes with a study of the cotton trade and industry in the Indian Empire.

The Kapok Industry. — SALEEBY, MURAD M. *The Government of the Philippine Islands, Department of Public Instruction, Bureau of Agriculture, Bulletin No. 21, pp. 1 + plates VIII.* Manila, 1913.

The Bulletin is written to supply the steadily increasing demand for reliable information concerning the culture of kapok. It is based on experience in Java and the Philippines.

The kapok tree is extensively cultivated in the East Indies, Tropical Asia, Ceylon, Java and the Philippines. There are some eight species known in Tropical America, but their product is inferior to that of the true kapok, *Cesiba pentandra* Gaertn. (= *Eriodendron anfractuosum*). It is sometimes confused with the species of the allied genus *Bombyx* of which there are 40 or 50 species all yielding floss of an inferior quality. They can be distinguished by their much greater size (the true tree seldom exceeds 40 feet) and their much larger red flowers, 3 to 4 inches in length.

Seed selection. — The majority of the trees in the Philippines are propagated by cuttings. Some are raised from seed without the slightest regard to the selection of good seed of desirable parentage, and this accounts for the lack of uniformity in size, number and development of pods. Seed should be selected from trees more than 5 years old, of rapid growth, early and regular fruiting habits and which are heavy yielders.

The following table shows the wide variation in the characters of the

Climate. — Successful cultivation can only be accomplished in the tropics and the best results are obtained at an altitude below 1,500 feet. It must withstand comparatively long periods of drought and from the first emergence of the flowers until the pods have been harvested a period of bright light is essential. Continuous showers of rain during this period, especially the latter part of it, often seriously interfere with the development of the pods and damage the floss. Strong winds, particularly typhoons, cause serious damage to the long heavy horizontal branches and often uproot the

Length of pod	Total weight of pod	Weight of floss	Number of pods
mm.	gms.	gms.	
152	39.5	7.0	104
137	33.5	5.9	108
129	30.0	5.0	140
113	27.0	4.9	100
106	24.7	4.7	110
101	17.5	3.0	7

Cultivation. — This tree flourishes in a wide range of soils, but the results are obtained from a well-weathered volcanic soil. Inferior are generally considered unsuitable for planting on a large scale, and to the somewhat low returns from kapok it does not justify itself on a soil unless grown as a subsidiary crop.

Cuttings should not be of the same season's growth; they should be one half to 2 metres (18 in. to 6 ft. 6 in.) in length. They are planted 50 cm. (20 in.) deep at the beginning of the wet season. Trees grown from cuttings generally yield a crop 6 to 12 months earlier than those from seed propagation has distinct advantages in healthier trees, more ductive and resistant to wind and pests. Seeds are sown at the beginning of the wet season in hills 15 cm. (6 in.) apart. Until the seedlings have attained a height of 12 to 15 cm. (5 to 6 in.) they require shade protection. They are ready for transplantation at the age of 10 to 12 months. At transplantation, all the leaves should be removed and the stem cut to a height of 50 cm. (20 in.). The trees should be planted in straight rows 6 or 6 ½ metres (20 or 22 ft.) each way. No cultivation is required until established, unless some intermediate crop is grown. As secondary crops the following are recommended: Maguey, sisal, henequen, Mauritius l.

Harvesting. — The first crop is obtained between the third and fourth year; normal crops are borne in the sixth and seventh years, with increasing yield up to the thirtieth year. Harvest must be completed in June before the wet season. The pods are harvested when light brown and wrinkled. Unripe pods yield floss lacking in lustre and liable to fermentation, while over-ripe ones yield a dull floss lacking in elasticity. The floss must be sorted, graded, and cleaned. Hand cleaning is very tedious and is now superseded by specially constructed machinery.

Marketing. — It is generally sold under two classes, cleaned and uncleaned. Each class is further subdivided into grades thus:

A. Cleaned: 1) extra; 2) good (prime Java), or first quality; 3) second quality; 4) damaged.

B. Uncleaned: 1) good, or first quality; 2) ordinary or fair quality; aged. The bales are made of about 10 cubic feet capacity and weighing 80 and 100 lbs. To effect this, a pressure of 80 000 lbs. is required. *Production.* — Java and the Philippines are the chief countries export-pok, and the amount exported is but a small fraction of the quantity produced.

Years	Total exported in tons	
	from Java	from the Philippines
.....	4 400	—
.....	4 675	—
.....	6 300	4
.....	5 875	13 ½
.....	8 250	37
.....	6 900	27
.....	8 000	10
.....	7 930	30
.....	9 906	98
.....	10 235	31 ½

The exports from British India and Ceylon amounted to 200 tons in 1900 and this amount has not increased since; the product is decidedly inferior to that from Java.

Yield. — From average trees of normal growth under seven years the yield is estimated at 350 to 400 pods. Trees from seven to ten years should yield 600 pods or more. In some cases 150 pods yield 1 kilo (2.2 lbs.) of floss, but the average is more nearly 230 pods per kilo. Thus 100 acres of land containing 280 trees should yield about 100 000 pods, producing 450 kilos of clean kapok per year. In the tenth year this would be increased to 640 kilos. The yield of seed is double that of the floss.

By-products. — The seed is roasted for food by the natives of India in times of famine. The Chinese and Javanese extract an oil from the seed, which is used for soap making and adulterating other oils, whilst the residue is used as a manure or as cattle feed. Analysis shows that the seed contains about 2 per cent. of oil.

The trunk is used for telegraph poles and as a support for pepper plants. The wood, which is light and soft, is used for tanning leather and other minor

purposes. It also yields a dark red opaque gum which has medicinal purposes. The bark contains a reddish fibre sometimes used for tying purposes.

Enemies and Diseases. — It has few serious enemies. *Dysdercus* *gulgatus* Fabr. attacks the pods, and a species of *Helopeltis* attacks the leaves. The worst enemies are bats and monkeys. No fungus or bacterial disease has yet been reported as attacking the kapok tree.

1150 — **The Cultivation of Sisal Hemp in German East Africa** (1). — By WERNER FRIEDERICH in *Arbeiten der Deutschen Landwirtschafts Gesellschaft*, No. 70 pp. Berlin, 1913.

Historical. — In the agricultural annals of the German colonies there is perhaps no example of so rapid a development as that of sisal. In 1898 Hindorf, on behalf of the German East Africa Company, bought in Freetown 1000 sisal plants which were sent to the Kikogwe plantation near the mouth of the Pangani; of this number only 62 took, and this is the origin of sisal cultivation in German East Africa which in 1912 occupied 52750 acres.

Extent. — In this colony sisal is cultivated: 1. In the North along Tanga-Moschi and Korogwe railways at the mouth of the Pangani. 2. From Dar-es-salam to Kilossa. 3. In the South in the Lindi Mikindani region near the mouth of the Rowuma.

After ceara, sisal is the most important industrial crop of this region.

	Area		Value of Ex.
	Planted	Bearing	
	acres	acres	£
Ceara	80 724	28 469	233 13
Sisal	52 697	28 067	221 000

Progression of the Exports of Sisal.

1901	15 tons
1905	1 400 "
1910	7 000 "
1911	10 000 "
1912	16 000 "

Varieties. — An unsuccessful attempt was made to introduce sisal from Yucatan: *Agave Fourcroydes* (Lemaire) or *A. elongata* or *A. rigida* var. *elongata*. At present the only variety grown comes from Florida (historical); it is the same as "Henequen verde" of the Spaniards or "grün Sisal" of the Germans; its botanical names are *Agave Sisalana* Perrin or *A. rigida* var. *Sisalana*.

(1) For conditions of soil, cultivation etc. see also a report of a journey instruction by Hr. Bruck in No. 250, B., March 1913.

mate. — In German East Africa, sisal can be cultivated up to 1480 above sea level, but the best results are obtained below 660 ft. The amount of rainfall may vary from 39 to 48 inches, and it may even sink in places if the moist and dry seasons are sharply separated.

Position of German East Africa in the world's market of Agave fibre.

Henequen (Yucatan sisal)	136 766 tons
Sisal (Green sisal) :	
German East Africa	15 700 "
Java	3 900 "
Bahamas	3 100 "
Hawai	492 "
Papuaia	295 "

Elaeis Fruits without Stones. — GATIN, C. L. in *Journal d'Agriculture tropicale*, at 13, No. 145, pp. 205-208. Paris, July 1913.

All seedless fruits are called *parthenocarpic* and the phenomenon which is in the production of fruits without seeds is known as *parthenocarpy*. *Parthenocarpy* is said to be *vegetative* when the pollen does not come in contact with the pistil; and *stimulative* when the pollen coming in contact with the stigma does not cause fecundation but only a slight stimulus.

Varieties of Elaeis nigrescens.

Varieties	<i>communis</i> (A. Chev.)		<i>pistifera</i> (A. Chev.)	<i>Cordata</i> (A. Chev.)
	typical form	form with thin shell		
1) oily pulp, proportion by weight . . .	48 %	68 %	84 %	85 %
2) stones . . .	large thick shell	tendency to grow smaller	small, shell very thin, sometimes absent	small, thin shell
3) proportion by number . . .	1/10	1/10	rare	2/3
4) characters . .	small, pulp: not very oily: very hard stone	oily pulp: tender stones		almost as large as the normal fruit, pulp oily

The parthenocarpic fruits of *Elaeis* seem to belong to this latter case. A closer knowledge of their production would be of great interest from the point of view of the study of the biological conditions attending upon the production of varieties.

The subspecies *Elaeis virescens* will not be considered, not being of interest from a cultural point of view.

The table on the preceding page shows the difference between the several varieties of *Elaeis nigrescens*.

This table shows two points upon which selection should bear.

1) *Normal fruits*. The *pisifera* variety is particularly interesting for reduction of its stones.

2) *Abnormal fruits*. A special position must be accorded to the *Cera* variety, which shows a considerable proportion of fruits without stones.

1152 - Contribution to the Study of the Castor-oil Plant. — RIGOTARD, L. in *Annales Coloniales*, Year 1, No. 1, pp. 15 to 21. Paris, July 1913.

The writer gives some data as to the yield in oil of castor-oil seeds from French West Africa.

Guinea: Brown mottled seeds; oil from the whole seed 42.50 to 44 per cent.

Ivory Coast: Brown mottled seeds; stems brown or red. Oil: 43.36 to 44 per cent.

Upper Senegal, Niger.—Several varieties (blood-coloured castor, from Brazil, Zanzibar, etc.): 41.7 to 54.6 per cent. This latter figure, which responds to 64.77 per cent. of oil in the kernel, has been obtained from seeds that came from Brazil and were cultivated in French West Africa. In term of comparison it is stated that Indian castor gave an average of 47 per cent.

1153 - Plantation Rubber in Hawaii. — ANDERSON, W. A. in *Hawaii Agricultural Experiment Station, Press Bulletin*, No. 44, pp. 1-12. Honolulu, July 1, 1913.

This Bulletin contains the last results obtained in the Naikua plantation.

1. *Distance*. — It is more advantageous to plant closely and subsequently thin out until those that remain are 20 by 20 feet apart, than to plant trees at once at this distance. The chief advantage of the system is that it allows selection by means of thinning. The disadvantage of less union of the stand due to selection will be amply compensated by the increased yield during the first years (owing to the greater number of trees).

2. *Multiplication*. — In order to make a new plantation the best way is to use selected cuttings taken from the best yielding trees.

3. *Cultivation*. — The control of weeds by means of hoeing is too costly and causes loss by erosion; the most practical method was found in the use of soda spray, provided it be not allowed to touch the stems of Ceara trees under two years of age or of Hevea trees at all. The aeration of the soil by means of dynamite costs only 15 to 20 dollars an acre, and does not cause much erosion.

4. *Tapping*. — Up to now the best way of tapping Ceara consists in removing the outer bark in narrow vertical strips and tapping these strips in incision, allowing the latex to coagulate on the ground. It is hoped that some type of container will soon be found.

5. *Curing*. — This operation has a very great influence on the quality of the product. Drying in the air at ordinary temperature has not given a uniformly good product; it should be completed by the vacuum dryer at actual temperatures not greater than 120° F.

6. *Value*. — When it is properly prepared, Hawaii Ceara commands prices not much inferior to those of Ceylon plantation, namely about 10 per cent. less.

— *Experiments in Manuring on a Tea Estate in Darjeeling*. — BALD, C. In *The Agricultural Journal of India*, Vol. VIII, Part. II, pp. 157-160. Calcutta, April 1913.

The plan of the experiments was as follows :

No. of plot & manure applied	Manure applied		
	1909	1910	1911
1	Castor meal, 14 maunds per acre	Castor meal, 4 maunds per acre. Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	id. id. Superphosphate, 60 lbs. per acre. Sulphate of ammonia, 120 lbs. per acre.
2	Mature leaves of <i>Coffea indicus</i> .	id.	id.
3	Castor meal, 7½ maunds per acre	Nitrate of potash, 40 lbs. per acre. Superphosphate, 120 lbs. per acre.	Animal meal, 2 maunds per acre.
	Nothing (check plot).	Nothing (check plot).	Nothing (check plot).

The block of land which was selected for these experiments was as equal in quality as it was possible to obtain, but the event proved the quality of the check plot soil was the best.

A digest of the results for the three years in crop is as follows

Tea per acre in	1909	1910	1911	Total
	lbs.	lbs.	lbs.	lbs.
Plot No. 1	247	265	345	857
" No. 2	239	313	324	876
" No. 3	258	270	312	840
" No. 4	275	305	286	866

With a view to determining whether there was any difference in quality of the teas produced under the different circumstances, samples of tea from all four plots were prepared and were valued on September 18, 1911. The valuations per lb. were 10½d, 11d, 9d and 1s respectively. The cost of treatment works out as follows:

	1909	1910	1911	Total
	£ s d	£ s d	£ s d	£
Plot No. 1	4 5 4	2 4 6	2 19 6	9 9
" No. 2	— 6 1	— 6 1	— 6 1	— 18
" No. 3	2 2 8	1 1 10	1 1 2	4 5
" No. 4 check plot; no expenditure.				

The total crop from No. 4 is comparatively high. Apart from the question of the relative quality of the teas produced, the extra crop from No. 4 is not sufficient to pay for the treatment given it, while the cost of treatment to No. 1 is altogether prohibitive.

The valuation of the samples places No. 4, the untreated plot, highest higher than any of the others, while the green-manured plot comes second and the plot treated with animal manure is given a very low place. These valuations, however, cannot be regarded as final.

Some of the outstanding facts in connection with these experiments are the high cost of chemical and artificial manures in a remote district like Darjeeling, the extreme doubtfulness of their economic utility, above all the fact that green manuring is the cheapest method and at the same time produces remarkably satisfactory results.

Cultural Experiments with Medicinal Plants at Korneuburg in 1912. — KLACHKA, WILHELM. (Mitteilungen des Komitees zur staatlichen Förderung der Kultur von Arzneipflanzen in Oesterreich, No. 15) in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 8, pp. 833-848. Vienna, August 1913.
 1. comprehensive report of the cultivation of medicinal plants in Austria
 2. Detailed information respecting the sowing, development, management (in many cases manurial experiments), harvestings, yield, etc., of the following plants: hollyhock (*Althea rosea*), *Ancylus officinarum*, *Angelica nigella*, *Anthemis nobilis*, marigold (*Calendula officinalis*), *Cnicus benedictus*, hemlock (*Conium maculatum*), thorn-apple (*Datura Stramonium*), poppy (*Papaver Rhoeas*), *Datura Tabula*, foxglove (*Digitalis purpurea*), *ana lutea*, *Grindelia robusta*, *Hyosciamus agrestis*, henbane (*Hyosciamus Hydrastis canadensis*, hyssop (*Hyssopus officinalis*), *Mentha crispa*, *der* (*Lavandula spica*), *Levisticum officinale*, *Mentha canadensis* var. *ascens*, peppermint (*Mentha piperita*), rue (*Ruta graveolens*), sage (*Salicifolialis*), *Spilanthes oleracea*, valerian (*Valeriana officinalis*), *Verbascum olides*.

Cultivation of Lavender in the South-East of France. — ROLLAND, M. in *La Vie Agricole et rurale*, Year 2, No. 37, pp. 285-289. Paris, August 16, 1913.

Economic position of essence of lavender. — For the last twelve years the price of essence of lavender has more than doubled, and has kept during several seasons at about 10s 9d per pound. This rise seems to be due to the discovery of a process which allows the economic extraction of this essence of some compounds used in the manufacture of perfumery. On the other hand the yield of lavender plantations diminishes yearly and the work of reafforestation carried out by the Forest Administration reduces considerably the areas on which wild lavender grew.

Species of lavender. — They are numerous in France. But as the most needed French lavenders are those gathered on the subalpine chains of the South-East, especially in the Departments of Drôme, Hautes-Alpes, Alpes, Vaucluse and Alpes-Maritimes, the writer only mentions the species of lavenders which are found in that region and which are interesting from a cultural point of view. The essence of lavender proper is supplied by two forms of *Lavandula vera* DC.: *Lavandula vera fragrans*, Jord. and *Lavandula vera delphinensis*. These are the only two small species which are cultivated to be multiplied and they are found most frequently associated in their natural habitat. These two real lavenders are not found in the South-East at a height inferior to 1300 feet. Below this height they have yielded place to common lavender: *Lavandula spica* Chaix or *latifolia* Vill. This lavender gives an essence of inferior quality, which is especially used in the preparation of varnishes and costs usually only from 2s 10d to 3s 7d per pound. In the belt where *Lavandula vera* and *L. spica* are neighbours, growers have always found another species which they call "bastard lavender" and which yields a very inferior essence. M. Chatenier has named this bastard lavender to be a hybrid of *L. v. fragrans* and *L. delphinensis* with *L. spica*.

Essence of lavender. — The essence is especially concentrated in flower, the peduncle containing only a very small quantity of it. In harvesting, however, this peduncle is cut at a length of about 4 to 6 inches close to the first leaves. The composition of essence of lavender is complex. It owes its perfume to several bodies; it contains also some compounds which diminish its value to a varying degree according to the origin and the amount of care bestowed upon the distillation. It is admitted that the fundamental element of the perfume is an ether of linalol, the acetate of linalyle $\text{CH}_3\text{COO.C}_{10}\text{H}_{18}$. The amount of this ether contained in real essences of lavender produced in the South-East of France is in some localities 40 to 42 per cent., while it sinks to 22 per cent. in less favourable situations.

Influence of altitude, aspect and nature of the soil. — In the cultivated state the two real lavenders thrive and acquire enormous development on the sea coast, as is proved by some tests. The essences from plants gathered well below 1300 feet have commanded the same prices as those prepared from natural lavenders growing at medium heights. As altitude seems to exert an influence on the quantity and quality of the essence produced, but its effect unites with that of altitude; it remains to be observed in cultivations at lower elevations. As to soil, lavender seems not to be very exacting.

Creation of a lavender field. — M. Cornillac has planted a lavender field of 25 acres at about a mile from Valence. The soil is sandy with a good deal of stones and gravel; the subsoil, which begins at a depth of 16 inches, consists of big stones, gravel and building sand. The whole is a subject to drought and of a low value for farming. The land was ploughed to a depth of 16 inches and the lavender was planted, between November 15 and the end of February, in rows 46 inches apart, and the plants 4 inches in the rows. These were transplanted from an altitude of 1000 feet; almost all of them struck, less than 1 per cent. failing. The field contains 105,000 plants, which cost delivered at the field 4s 4½d per hundred. The men were paid 2s 9d per day.

The cost of the whole field was:

	£	s	d
Ploughing ,	25	1	3
Purchase of plants	230	3	4
Compost and manure	11	17	11
Planting ,	41	2	4
Total . . . £	308	4	10

or £21 9s per acre.

It is especially to be noted that the young plants cut with the pruning scissors, shoot forth again easily and that for this result it is of the greatest importance to keep the field free from weeds during the first year.

Sometimes, in planting a new field, old stocks are used; they are divided into pieces and planted, but their striking is uncertain. Young plants

also be obtained by sowing in a nursery. M. Cornillac has most successfully tried this method. The subsequent cultivation consists in hoeing two or three times. The first year the flowers that appear are suppressed so as to exhaust the plants by allowing them to produce seed.

Lavender and truffle oaks. — The writer mentions several remarkable experiments on the growing of lavender in truffle producing oak plantations.

Regeneration of natural lavender fields. — Many landowners have come to regenerate their natural lavender fields by ploughing them in a way as to leave only the plants in lines about 3 ft. 3 in. apart.

Artificial manures. — Experiments hitherto made allow the conclusion to be drawn that the use of artificials increases the quantity of flowers; the essence seems also to increase, and the quality of the perfume does not seem to be impaired.

Yield of a planted lavender field. — The writer, agreeing with M. Zacharz, states that an acre of lavender, planted in a favourable locality and irrigated with artificials, produces in ordinary years as follows :

1st year	Insignificant crop				
2nd "	1784 lbs. of flowers yielding	12.5	lbs. of essence		
3rd "	3122 " " "	21.5	" "		
4th and following years . . .	4460 " " "	31.2	" "		

Thus at the average price of 10s per lb. the gross returns of a lavender field after its fourth year would be about £15 10s. The cost of gathering is more than 5 1/2d per hundred pounds. The cost of distillation is about 1d per lb. of essence. The cost of hoeing and of manuring is about 2s per acre. All the expenses together are within £3 12s. Thus the net returns are about £12 per acre.

Diseases of lavender. — The two most important, dodder and rot, are much to be feared.

- On an *Allium* from the Mediterranean Region which might be used as a Vegetable. — TRABUT, L. in *Revue Horticole*, Year 85, No. 13, p. 311, 1 fig. Paris, July 1, 1913.

Allium triquetrum L. is well known along the Algerian coast, especially in the neighbourhood of dwellings and in gardens, and is very much appreciated by the Berber population, who use it in large quantities during the winter. Culinary experiments of the writer have shown that the entire plant can be used to replace other vegetables in the winter months. Its leaves are tender when cooked and of good flavour.

The writer has also experimented with the cultivation of this onion; and it is necessary to plant the bulbs towards the end of summer at a depth of from 15 to 20 cm. (6 to 8 in.) in order to obtain a good substitute for leeks. The bulbs planted separately and deeply in good soil produce plants in the winter, the portion below ground being blanched, very tender and appetising. With the green leaves removed they constitute an excellent vegetable free from all smell of garlic or leek and compatible

with any sauce. The writer has no hesitation in recommending this vegetable thus treated as a most interesting acquisition to gardens on the borders of the Mediterranean.

1158 - **The Sexual Organs of Vine Hybrids.** — GARD, M. in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 3, pp. 226-228, July 21, 1913.

I. In the cases of the male flowers (with long stamens) and the hermaphrodite flowers (with short recurved stamens), the pollen of the wild varieties is normal, the proportion of the empty grains not exceeding 10 to 15 per cent. In cultivated selected varieties, however, a larger degeneration was noticed, the empty grains amounting to 50 per cent. and upward.

II. In the cultivated European vine two cases occur: 1) the pollen is often normal; 2) it consists of three kinds of grains: empty, normal and intermediate. According to the vine, sometimes the number of the two are equal, sometimes one or other predominates, but the full grains are generally the most numerous.

In the wild varieties, as in the cultivated, the cases where the pollen is normal are more numerous than those where it is degenerate. We have no information as regards the causes of this degeneration.

III. The pollen of double hybrids is always modified, through to a varying degree, in the case of males, hermaphrodites with long stamens and hermaphrodites with short stamens. Often grains occur which are small, deformed, of abnormal appearance, not swelling in water, and with a very varied content resembling in optical section (like those of some cultivated vine varieties) a cap, a crescent, or a crown.

In three-quarter, triple and quadruple hybrids there are also considerable differences according to the hybrid examined; the proportion of empty grains may be nearly normal or very great. The quantity of pollen can present great variations.

The female organ, on the contrary, is as perfectly formed in hybrids as in species. The embryo-sac is never lacking in the ovules, and there are on the average more numerous than in the case of the parents.

IV. The pollen of short stamens, has, as is well known, very different morphological characters from that of the pollen of long stamens. From the cytological point of view, the writer has observed in the former a generative cell and a vegetative nucleus similar to that occurring in the latter, while the deformed grains which are nearly or quite empty in both cases lack a generative cell, or in any case the nucleus of the cell has degenerated.

Although not sterile as was supposed, the pollen of the short stamens is considered incapable of fertilizing the pistil of the same flower. The writer has proved the truth of this statement as regards *V. cordifolia*, Jacq. d'Aurelles, Blue Favourite, Massasoit and Black Eagle, while in the long-stamened flowers the pollen is fertile to the pistil of the same flower (1).

(1) See No. 1430, B. Oct. 1912.

V. The facts presented by the sexual organs of vine hybrids are thus an exception to those already known, and do not agree with the statements of M. Couderc. The male elements are altered to a more or less considerable extent, while the female organs remain intact, according to the fact that ovules which occur in small numbers undergo no degeneration. Mr. Booth has described two distinct forms of pollen, the one fertile and the other infertile, independently of the length and habit of the stamens, and which may occur together in certain American vines. They doubtless correspond to the normal and altered grains of hybrids and of original vines. Their occurrence in the varieties studied by the writer is a surprising matter, seeing that the former are natural hybrids, though the fact is denied by a certain American school which is under the influence of Engelmann's ideas.

- **The Reconstitution of Swiss Vineyards.** — FAES, H. in *Revue de Viticulture*, par 20, Vol. XL, No. 1026, pp. 210-213. Paris, August 14, 1913.

In the spring of 1912, the Canton Vaud used in the reconstitution of vineyards 1 371 250 meters (1) of "grafting wood", of which 194 150 m. furnished by the Cantonal nurseries. The following were the varieties most in demand: *Riparia* × *Rupestris* 3 309 (625 300 m.), *Riparia* × *Rupestris* 101¹⁴ (300 400 m.), *Riparia* × *Rupestris* 3 306 (137 750 m.), *rupestris* × *Rupestris* 1202 (99 500 m.), *Berlandieri* × *Riparia* 420 A (50 m.). The vintage of 1911, which was good on the whole, influenced the grafting of the spring of 1912 and gave rise to a greater demand of grafting wood (1 096 985 m. in the spring of 1911). A "grafting department" was carried on as usual at the Champs-de-l'Air Vine-growing Station. In considering the vineyards in Switzerland which have been reconstituted on American stocks, it is possible, taking them as a whole, to arrive at certain conclusions; though these may not be final, they are sufficiently satisfactory to permit of the work of reconstitution being continued with a certain amount of security.

At the beginning of the reconstitution operations, *Riparia Gloire de St. Pierre* and *Rupestris* were used amongst other "pure American stocks" in a certain number of vineyards. Subsequently, *Americo* × *American* and *Franco* × *American* stocks have been substituted for those first planted and now tend to entirely replace them.

In the Canton of Geneva, it is found that *Riparia Gloire*, when planted in a good situation on deep, damp, slightly calcareous soil produces regular and good crops. It has, however, the defect of sometimes losing its vigour, after four or five crops, if it is planted in less fertile, although deep soil. It is thought that the hybrids give better promise, especially as regards the future.

At Neuchâtel, *Riparia Gloire* has proved to be prolific and has grown in a fine plant on certain rich, deep soils poor in lime. But these special

[1] One meter = about 3 ft. 3 in.

soils are very rare in the district, where most of the soil is dry and shallow. *Riparia*, also, has never been a favourite in this Canton.

In Ticino, *Rupestris* is being given up, as its wood ripens badly, especially in cold, wet seasons. It is also believed to have been observed that during severe winters, plants grafted on *Rupestris* suffer from frost more than do other vines. With regard to *Riparia*, the latter stock gave fine results in the southern part of the Canton, where the reconstitution was begun on the best soils of the district. Disappointment, however, followed in the Lugano neighbourhood, where the soil of the vineyards is more stony. It is recorded that here also *Riparia* is abnormally productive at first, but soon perishes, all the more owing to the long pruning adopted in order to obtain a larger crop.

In the Canton Vaud certain soils have been found to be perfectly suitable to either *Riparia* or *Rupestris*. But in consequence of the shearing practised in the Swiss vineyards, this latter stock tends frequently to promote the vegetative growth of its scion at the expense of the fruit, which causes the grapes to ripen late. *Riparia* Gloire has proved especially unsatisfactory on a heavy, cold type of soil, such as that often present by glacial clays, irrespective of the amount of lime present.

Americo \times American stocks, and especially *Riparia* \times *Rupestris*, are being increasingly substituted for pure American stocks, owing to their greater powers of adaptation. *Riparia* \times *Rupestris* 3309, 101¹⁴, 31, and 11-F form at the present time the basis of reconstitution in most of the Swiss vineyards with poor or average soil; of these the two former are by far the most common. So far, the said stocks have given satisfactory results in the majority of cases. *Solonis* \times *Riparia* 1616, a hybrid much in demand only a few years ago, is now out of favour, as it is considered, perhaps wrongly, to possess insufficient power of phylloxera resistance. In the Canton Vaud, for instance, *Riparia* \times *Rupestris* 101¹⁴, which has also been planted in numerous vineyards, is without doubt a stock suitable for many average, rather heavy, and even heavy soils. It should not be planted in very light dry soils, or in those wanting in depth, for it is easily affected by drought. It nearly always prefers somewhat heavy soils, or very light ones. This vine must not be grown in tufaceous soil, or in calcareous marls, as its resistance to calcium carbonate is not sufficient to allow of its normal development in soils of this nature.

In the same district, *Riparia* \times *Rupestris* 3309 gives excellent results on a large variety of soils, and replaces the *Lot* variety on gravelly and light soils. The writer has often seen magnificent specimens of this vine, covered with fruit, growing on the gravelly soil of the Aigle district. On the other hand, 3309 having been quite recently introduced into Switzerland, plantations on this stock are, as a rule, younger than those grafted on *Lot*. When their progress has been followed for a few more years, it will be possible to decide authoritatively upon the type of soil best fitted for this stock, which is much in request now-a-days.

The Canton of Neuchâtel has proved especially suitable to *Riparia* \times *Rupestris* 3309.

in the Canton Ticino, *Riparia* × *Rupestris* 101¹⁴ has gained the favour of the vine grower. Its adaptability to vineyard soils of different positions in that district is relatively great; its growth leaves nothing to be desired, and its fruit-bearing property is well developed. *Riparia* × *Rupestris* 3309, which has recently been introduced, especially on dry soils, appears so far to be suitable also to the Ticino vineyards.

As regards the Franco-American stocks, *Aramon* × *Rupestris* 1 and *Mourvèdre* × *Rupestris* 1202 have been planted, but very few *Chasselas* × *Berlandieri* 41-B. Franco-Americans have especially been used on calcareous soils, even when damp, where other stocks would not

At Arnex-sur-Oibe, in the Vaud vine district, there are very stiff marls containing a uniform amount of from 40 to 60 per cent, dry fine carbonate of lime. The whole series of *Riparia* × *Rupestris*, *Aramon* × *Riparia* 1616, the pure Americans, *Riparia* Gloire and *Rupestris* 1202, perish very quickly on such soils. Only *Aramon* × *Rupestris* 1, especially *Mourvèdre* × *Rupestris* 1202, which is still more chlorosis-resistant, have given results which can be called favourable. It is also interesting to observe that hitherto in the Arnex vineyards, which are much infested with phylloxera, where this insect has done great damage since 1890, the above-mentioned Franco-American stocks proved sufficiently phylloxera-resistant, while the young vines of the country which had been raised along side by persons hostile to the new methods, succumbed in a few years to the persistent attacks of the insect.

In general, however, the present tendency in Switzerland is to reduce the number of Franco × American stocks used, as the reproaches levelled against the vines grafted on *Rupestris* du Lot are still more merited in the case of grafts upon *Aramon* × *Rupestris* and *Mourvèdre* × *Rupestris* 1202. These stocks have often a marked inclination to over-stimulate the vegetative growth of their scions; they run too much to wood. Some long measures of pruning occasionally remedy this defect, but produce large crops which are liable not to ripen well, especially in cold seasons. A delay in ripening is nearly always noticeable, under Swiss climatic conditions, in vines grafted on *Mourvèdre* × *Rupestris* 1202 or *Aramon* × *Rupestris* 1. This fact would not be of much importance if it were only a question of quantity of the grapes, but the Swiss vine-growers are very tenacious in maintaining the quality of their local wines.

At the present time, many experiments are being made as to the possibility of substituting, especially in the case of choice vineyards, *Berlandieri* hybrids for the above-mentioned Franco × American stocks. *Riparia* × *Berlandieri* 420-A, and 157 157¹¹ have been most used; 34 E M and *Chasselas* × *Berlandieri* 41-B appeared weaker. There still remain to be tried the hybrids of the Hungarian *Riparia* × *Berlandieri* Teleki series, of which some are worthy of experiment.

Owing to the fact that the *Berlandieri* variety was accustomed to a hot climate, the preconceived idea still prevailed only a few years ago that the hybrids of this vine would not succeed in Switzerland. But in the experimental vineyards, the *Berlandieri* hybrids now bearing produce a

crop which is relatively satisfactory, both as regards quantity and quality even when growing in fairly northern situations, such as the Bernese vine district on the shore of the Lake of Bienné. No doubt, during the first few years, the vines which have been grafted on these stocks do not develop as vigorously as their neighbours grafted on *Riparia* × *Rupestris* or *Aram* × *Rupestris* 1 and *Mourvèdre* × *Rupestris* 1202, but they quickly make up for lost time and begin to bear. Vineyards which have been replanted with *Berlandieri* hybrids deserve to be studied and closely observed, for on the other hand they are not sufficiently numerous to allow of any comprehensive opinion being formed upon their value in the general reconstitution of the vineyards of Switzerland.

1160 — **Manuring of Coconuts in the Seychelles.** — RIVALTZ DUFONT. Contribution à l'étude du Cocotier aux Seychelles. — *L'Agriculture pratique des pays chauds*, Year No. 122, pp. 345-355. Paris, May 1913.

The quantity of mineral matter removed from the soil by the coconut is considerable when the fibre and leaves are not returned. The crop itself represents a very small proportion, only about one-fifth of this quantity. It is therefore desirable to utilise the leaves and other residues before considering other manures. The writer has studied the coconut fertilisers on the two types of soil in the Seychelles.

1) *Madreporetic soils.* — They occur in the outlying islands, which are extremely fertile owing to deposits of guano having the following composition.

Moisture	7.20
Organic matter	12.50
Lime	44.30
Magnesia	1.70
Potash	0.38
Phosphoric acid	30.85
Sulphuric acid	0.69
Silica	2.06
Iron, alumina, etc.	0.36
	<hr/> 100.04

There is a deficiency of potash, but according to Boname the coconut utilises considerable quantities of sodium salts during the growth of the florescence, and it appears that less potash is consumed and the two are interchangeable in the requirements of this plant.

2. *Granitic soils.* — These soils require neutralising with lime or guano. Potash is generally deficient in soils that have been cultivated for a long time. Phosphoric acid is supplied economically by the guano, which costs only 16 to 24 s per ton at Victoria.

Potash manures. — Sulphate of potash should be preferred, as the quantity of potash in it (at Bombay or Colombo) costs only 4s 9d, as compared with 7s in kainit. The writer recommends the application of 45 to 90 lbs. per acre buried in trenches round the trees.

Nitrogenous manures. The writer recommends green manures (*Lespedeza candida*, etc), seaweed and farmyard manure where possible. An excellent manure for coconuts could be obtained by the organisation of fish-

The Forests of Taiwan (Formosa). — THE GOVERNMENT GENERAL OF TAIWAN, Statistical Summary of Taiwan, pp. 21-24, 429-430. Tokyo, 1912.

The Island of Taiwan is rich in forests and in unreclaimed lands on borders of those forests. Its total area, including the beds of rivers, 888 sq. miles.

General Conditions of Forests. — The forests of Taiwan comprise, to the high altitudes of some of the mountains and to great variations in meteorological conditions, all kinds of vegetation belonging to tropical, subtropical, temperate and even to subalpine climates. The island in the civilized part of the island had under the Chinese rule been to a great extent cleared of trees. Of late years, however, reforestation has been begun and a great improvement is already noticeable. The lands on the frontiers of the savage tribes are nearly all covered with natural forests in which abound « obtuse ground cypresses » (*Chamaecyparis obtusa* Sieb. et Zucc.), camphor-trees and « pointed oak » (*Quercus taibaiensis*).

Preservation forests. — The utilization of forests in Taiwan is still in its infancy. As for the official exploitation of forests, the camphor trade is the only enterprise worth mentioning. Nevertheless the indiscriminate felling of trees for purposes of reclamation has caused grave fears as to the proper caring for the river courses. It follows that while it is desirable to secure increased exploitation of forests, it is important to set aside certain preservation forests in the catchment basins. The Government General is therefore establishing such forests. Their area amounts to 59,092 acres.

Purchase or sale of government forests or wild lands. — The largest number of transactions formerly took place under the Regulations for the Private Sale of Forests and Wild Lands, the total area disposed of in this up to the close of 1910 amounting to 134,750 acres. Next in area come those dealt with according to the Regulation for the Encouragement of the Cultivation of Camphor Trees. In 1911, however, more forests and wild lands were sold under the latter regulations than under the former. The total area of forest and waste land sold and leased from the beginning up to the end of 1911 amounted to about 310,660 acres.

Reforestation and nurseries. — The Government is not only conducting reforestation on its own account, but is giving encouragement to private individuals to engage in the same work. The trees thus planted consist of camphor-trees, *Acacia confusa*, Merril pines, cryptomerias and other needle-leaved and broad-leaved trees. At the close of 1911 the total afforested area was about 39,200 acres.

Forestry Experiment Stations. — Owing to the special nature of vegetation in the island, the Industrial Section of the Department of Civil Affairs established in May 1911 the Forestry Experiment Station at Keelung with two branch stations. According to its regulations the main object is to carry out the following work:

1. Investigation and introduction of useful plants both from Japan and other countries.

2. Investigations and experiments connected with afforestation, as, as the exploitation and preservation of forests.

3. Improvement of seedings and their distribution.

Training of forestry experts. — The primitive state of the forestry industry in Taiwan induced the Government in 1908 to commence training men for the work, so that every year fifteen experts may be supplied to the Local Government and to private parties.

In 1910 Rules for Investigating Forests and Wild Lands were issued according to which the surveys and investigations of forests are being actively carried out.

Arisan forests. — These famous forests, which are being exploited by the Government of Taiwan, are situated within the savage land limits and comprise a total area of 26 950 acres containing timber estimated at 200 million cubic feet. The forests are found at altitudes ranging between 2800 feet and 8700 feet above sea-level and are reached by a forest rail 41 miles long, from the main line. The exploitation of these forests originally started as a private undertaking but was transferred to the Government through purchase in 1910. In the lower parts of the forests are found camphor-trees, oak, *Alnus maritima* Nutt. var. *Formosa* Burkill, *Machilus Thunbergii* S. and Z. and *Quercus cuspidata* Thunb. which are broad-leaved; in the upper portions occur the conifers: *maecyparis Formosensis* Mats. *Ch. obtusa* S. and Z. form *Formosana*; mixed with cedars, *Pinus Formosana* Hay, *Tsuga Sieboldii* Carr. The Government has adopted the plan of entirely renovating the Arisan forests in thirty five-years by felling certain portions each year and reforesting them afterwards. According to this plan the average felling each year will amount to 3 million cub. ft. of conifers and 1 200 000 cub. ft. of broad-leaved trees. A railway and a sawmill will be built, and nurseries have been laid out on 17 acres.

Camphor industry. — As has already been stated the principal exploitation of the forests of Taiwan has been by the extraction of camphor organized as a State monopoly. The Island's Monopoly Bureau exported 7236 810 lbs. of camphor abroad and 1 137 780 lbs. to the refiners in 1914 together valued at about \$ 489 300.

It is undoubted that the camphor industry has suffered more or less as the operations for the better control of aborigines progressed; but the output of the year did not fall short of the estimates, the figures being 5961 100 lbs. of crude camphor and 7019 896 lbs. of camphor oil. Of these the amounts received by the Monopoly Bureau were: crude camphor 6072 100 lbs. and camphor oil 7514 489 lbs., which were less than the receipts for the previous year by 1 425 622 lbs. crude camphor and 1 019 732 lbs. of camphor oil. Up to 1911 the work of distillation was conducted entirely by private firms under contract with the Monopoly Bureau; but as there was an unnecessary waste and inferior quality of product the Monopoly Bureau began experiments in distilling camphor oil and in 1911 satisfactory distillation arrangements were completed. But as the plant is not big enough, a part of the work is still leased out to private firms as before.

- **Experiments on the Influence of Manures in Nurseries.** — CURT, E. Research Station of the National School of Waters and Forests, in *Annales de la Science Agronomique*, Year 30, No. 6, pp. 433-454. Paris, June 1913.

The experiments of Bartet were taken up again on a new system in 1906. The article describes the method of experimentation followed and gives results of some of the earlier experiments.

LIVE STOCK AND BREEDING.

- **The Cause of Fagopyrism. A Contribution to the Study of the Fluorescent Colouring Matters in the Seedcoat of Buckwheat.** — FESSLER, KURT in *Berliner Tierärztliche Wochenschrift*, Year 29, No. 28, pp. 497-499. Berlin, July 10, 1913.

After making analytical and spectroscopical investigations respecting colouring matters of the seedcoat of buckwheat, the writer is of opinion fagopyrism is caused by the crude chlorophyll.

- **On Four New Species and Two New Varieties of the Ixodid Genus *Haemaphysalis*.** — WARBURTON, CECIL in *Parasitology*, Vol. VI, No. 2, pp. 121-130. London, July 1913.

In his short introduction, the writer mentions that the examination of 1st number of ticks collected in late years from various hosts in many parts of the world, has resulted in the addition of several new species to the genus *Haemaphysalis*; the number of recognised species in this genus now has 43.

Just as *Rhipicephalus* is proper to Africa, so *Haemaphysalis* is essentially Asiatic, and the Indian region has furnished most of the newly described forms. One of the species described by the writer is African, the remainder being additions to the Indian fauna. The difficulties presented the genus *Haemaphysalis* are chiefly due to the fact that its characters are negative; the writer, however, states that there is no lack of clearly defined forms and gives a diagnosis.

Detailed descriptions follow of the new varieties and species mentioned:

Haemaphysalis aborensis (Yambug, India), *H. howletti* (Rawalpindi, India), *H. aciculifer* (Uganda), *H. kinneari* (Kanara, India), *H. cornigera* var. *nala* (India), *H. incrimis* var. *aponomoides* (Belgachia, Calcutta).

Eight figures illustrate the text.

- **New Species of *Ixodes*.** — NUTTALL, G. H. F. Notes on Ticks. III: On Four New Species of *Ixodes*. — *Parasitology*, Vol. VI, No. 2, pp. 131-138. London, July 1913.

The new species described in this paper are of interest, although the writer is not able to deal with females, as is frequently the case with this genus. One species (*I. kempi*), allied to the North American *I. angusta*, comes from the hitherto unexplored region on the north-east frontier of India, having been collected by the Abor Expedition. Two species, *I. daveyi* and *I. oldi*, are from Africa, and offer a peculiarity of structure in that they possess anal

grooves having the form of a horse-shoe, an appearance only hitherto served in three other species of *Ixodes*, all of which are African. The new species, *I. ricinoides*, is from China and is allied to *I. ricinus*.

The writer gives a description of the following species: *Ixodes kobo* (Kobo, Abor Country), *I. daveyi* (Rusvenzori, Uganda), *I. oldi* (Komaten, Sierra Leone), *I. ricinoides* (Wen-chwan-hsien, China).

This article is illustrated by four text-figures.

- 1166 - **The Distribution of Creatin in the Bodies of Mammals.** — BEKER, J. in *Hoppe Seylers' Zeitschrift für Physiologische Chemie*, Vol. 87, Part 1, pp. 1-10, Strasburg, August 16, 1913.

A communication giving the results of numerous analyses made ascertain the creatin and creatinin content of the organs of cow, goat, rabbit and dog. It was found that the largest amount of creatinin (31.4 mgm. per 100 gm. of organic substance) was present in the voluntary muscle and the least (9.76 mgm.) in the thymus gland. In 100 c. c. of blood, 2 to 2.17 mgm. of creatin was found. In the foetal condition, mammals have little of this substance, though much is present after birth. In animals in advanced pregnancy, the absolute and relative creatinin content increases. The right horn of the uterus of pregnant animals contains more creatinin than the left. The liver dehydrates creatin to creatinin.

- 1167 - **A Calorimeter for Small Animals.** — TANGEL, F. in *Biochemische Zeitschrift*, Vol. 53, Part 1-2, pp. 21-35, Berlin, July 15, 1913.

This calorimeter is constructed on the same principle as Bohr and Haselbalch's calorimeter devised for the determination of the heat product of the chicken embryo.

The heat production is thermo-electrically measured: the thermo-electric current produced by the increase of temperature determined by the production of the animal heat is measured by comparing it with the amount of heat derived from another source which produces an electric current of exactly the same strength (compensation). The calorimeter in question, the construction, working and management are minutely described by the writer, and of which he gives three diagrams, differs from the Bohr-Haselbalch apparatus in the method adopted for the thermic isolation of the chambers containing the small animals, the isolation being made more complete by the use of Dewar flasks. The fact that the animals move during the experiment was taken into account in the method adopted. Rats, mice, frogs and leeches were used for the experiments. The duration was 10 to 24 hours, allowing 1 to 1 1/2 hour to obtain the most exact compensation, there remaining 8 to 22 hours for the estimation of the heat production. The weight of the body and all its excretions can be calculated to one-hundredth of a gram. The writer will communicate the results of the first experiment in a later number of the *Biochemische Zeitschrift*.

The Effect of Previous Nutrition upon Metabolism during Fasting. — SCHLOMANN, ARTHUR and MÜSCHKAUSER, HANS in *Biochemische Zeitschrift*, Vol. 53, part 4-5, pp. 265-299. Berlin, July 22, 1913.

On the conclusion of experiments on the interchange of gases in fasting ren, the writers made further investigations at the Akademische Klinik at Dusseldorf, in order to ascertain whether, and how far, a pre-diet confined to one substance affected gaseous interchange in a hungry dog. The animals used for the experiment were first starved until they lost half of their weight, which was after the lapse of 16 days; their gaseous change (absorption of O_2 and production of CO_2) was then determined. Then the dogs were fed up to their original weight, after which followed another fasting period of 24 hours concluded by a respiration experiment. After the animals had taken food for the second time (for some of them) their gaseous exchange was investigated for a third time at the end of another fasting period of 24 hours. The food given during the experiment was fat in the case of dog I, carbohydrate in that of dog II, and in that of dog III.

A second experiment was undertaken by the writers for the purpose of determining in what manner metabolism took place in a dog when deprived of food for some length of time. To this end, the three dogs were deprived of food for 24, 48, 72, 96, 120, 144, 168, 192, 216, 240, 264, 288, 312, 336, 360, 384, 408, 432, 456, 480, 504, 528, 552, 576, 600, 624, 648, 672, 696, 720, 744, 768, 792, 816, 840, 864, 888, 912, 936, 960, 984, 1008, 1032, 1056, 1080, 1104, 1128, 1152, 1176, 1200, 1224, 1248, 1272, 1296, 1320, 1344, 1368, 1392, 1416, 1440, 1464, 1488, 1512, 1536, 1560, 1584, 1608, 1632, 1656, 1680, 1704, 1728, 1752, 1776, 1800, 1824, 1848, 1872, 1896, 1920, 1944, 1968, 1992, 2016, 2040, 2064, 2088, 2112, 2136, 2160, 2184, 2208, 2232, 2256, 2280, 2304, 2328, 2352, 2376, 2400, 2424, 2448, 2472, 2496, 2520, 2544, 2568, 2592, 2616, 2640, 2664, 2688, 2712, 2736, 2760, 2784, 2808, 2832, 2856, 2880, 2904, 2928, 2952, 2976, 3000, 3024, 3048, 3072, 3096, 3120, 3144, 3168, 3192, 3216, 3240, 3264, 3288, 3312, 3336, 3360, 3384, 3408, 3432, 3456, 3480, 3504, 3528, 3552, 3576, 3600, 3624, 3648, 3672, 3696, 3720, 3744, 3768, 3792, 3816, 3840, 3864, 3888, 3912, 3936, 3960, 3984, 4008, 4032, 4056, 4080, 4104, 4128, 4152, 4176, 4200, 4224, 4248, 4272, 4296, 4320, 4344, 4368, 4392, 4416, 4440, 4464, 4488, 4512, 4536, 4560, 4584, 4608, 4632, 4656, 4680, 4704, 4728, 4752, 4776, 4800, 4824, 4848, 4872, 4896, 4920, 4944, 4968, 4992, 5016, 5040, 5064, 5088, 5112, 5136, 5160, 5184, 5208, 5232, 5256, 5280, 5304, 5328, 5352, 5376, 5400, 5424, 5448, 5472, 5496, 5520, 5544, 5568, 5592, 5616, 5640, 5664, 5688, 5712, 5736, 5760, 5784, 5808, 5832, 5856, 5880, 5904, 5928, 5952, 5976, 6000, 6024, 6048, 6072, 6096, 6120, 6144, 6168, 6192, 6216, 6240, 6264, 6288, 6312, 6336, 6360, 6384, 6408, 6432, 6456, 6480, 6504, 6528, 6552, 6576, 6600, 6624, 6648, 6672, 6696, 6720, 6744, 6768, 6792, 6816, 6840, 6864, 6888, 6912, 6936, 6960, 6984, 7008, 7032, 7056, 7080, 7104, 7128, 7152, 7176, 7200, 7224, 7248, 7272, 7296, 7320, 7344, 7368, 7392, 7416, 7440, 7464, 7488, 7512, 7536, 7560, 7584, 7608, 7632, 7656, 7680, 7704, 7728, 7752, 7776, 7800, 7824, 7848, 7872, 7896, 7920, 7944, 7968, 7992, 8016, 8040, 8064, 8088, 8112, 8136, 8160, 8184, 8208, 8232, 8256, 8280, 8304, 8328, 8352, 8376, 8400, 8424, 8448, 8472, 8496, 8520, 8544, 8568, 8592, 8616, 8640, 8664, 8688, 8712, 8736, 8760, 8784, 8808, 8832, 8856, 8880, 8904, 8928, 8952, 8976, 9000, 9024, 9048, 9072, 9096, 9120, 9144, 9168, 9192, 9216, 9240, 9264, 9288, 9312, 9336, 9360, 9384, 9408, 9432, 9456, 9480, 9504, 9528, 9552, 9576, 9600, 9624, 9648, 9672, 9696, 9720, 9744, 9768, 9792, 9816, 9840, 9864, 9888, 9912, 9936, 9960, 9984, 10000.

It was found from these two experiments that the respiration quotient $\left(\frac{\text{production}}{\text{absorption}} \right)$ depends, in the case of a fasting animal, upon the substance

which have previously taken part in building up its body. The effect of one kind upon gaseous interchange during fasting is thus discernible, even after the direct effect of the last meal has long passed away. In the case of animals which have been deprived of food, anabolism is effective in a manner corresponding to the combustion processes of the previous diet. Through being fed upon a single substance, such as glycogen or fat, the body accustoms itself to consume more or less glycogen, or more or less fat. In animals accustomed to an exclusive fat diet, the respiratory quotient, even when they are fasting, is nearly the theoretical fat quotient; on an exclusive carbohydrate diet, the quotient approaches the theoretical carbohydrate quotient. In the case of long and continuous fasting, the effect on metabolism produced by a previous fat diet lasts longer than that of a carbohydrate diet, because the glycogen supply, when much consumed, is more quickly consumed than the fat supply.

By means of their diet, it is thus possible to exert a direct effect upon metabolism, and one which outlasts the feeding period and prepares the organisms for the task of breaking up larger amounts of fat or glycogen.

1169 - **The Influence of the Ingestion of Sodium Nitrate on Nitrogen Exchange**
 GRAFE, E. and WINTZ, H. in *Hoppe-Seyler's Zeitschrift für Physiologische Chemie*, Vol. 100, Part 4, pp. 283-414. Strasburg, July 21, 1913.

The writers summarize the results of the experiments of Barth, Röhm, Binz, Gerlinger, Gérard, Oppenheimer, Harnack and others upon the effect of sodium nitrate upon animal organisms.

They also give a description of their latest experiments made on a dog and three pigs, with the object of studying the action of sodium nitrate in increasing the amount of nitrogen eliminated by the organism. They follow like Ahderhalden and Hirsch, that sodium nitrate acts in four ways:

1. There is no change in the nitrogen exchange; the nitrate is again eliminated quantitatively.

2. The nitrate is eliminated quantitatively, but produces a great diminution in the loss of Kjeldahl nitrogen.

3. From 10 to 15 per cent. of the nitrate nitrogen ingested is retained in a stable form and remains in the body. At the same time, the Kjeldahl nitrogen exchange may, or may not, be modified in a favourable manner.

4. Strong doses of nitrate increase the elimination of Kjeldahl nitrogen.

The differences in the experimental results seem principally due to the amount of nitrogen administered.

1170 - **The Effect of the Iron Content of Blood Meal upon the Iron Assimilation of Animals fed with It.** — GROH, JULIUS in *Biochemische Zeitschrift*, Vol. 53, Part 1, pp. 256-258. Berlin, July 18, 1913.

The writer used as the subjects of these experiments two Yorkshire pigs weighing respectively 174 lbs. and 139 lbs. The experiment was divided into two periods, during one of which maize was fed, and during the other blood meal and maize. During the first period, which lasted 18 days in the case of pig I, and 8 days in that of pig II, the former received daily 4.4 lbs. of crushed maize, and the latter 3.3 lbs. The second period was preliminary in the case of both animals by a preliminary feeding period of 21 days itself lasted for 10 days. During this time, the daily rations were 2.5 lbs. of crushed maize, and 0.44 lbs. of blood meal per animal. The iron content of the food and excrement were determined gravimetrically. The accompanying table gives the results of the experiment:

I. — Maize period.

	Pig I	Pig II
	gm.	gm.
Iron ingested daily with the maize	0.425	0.34
Iron eliminated daily in the faeces	0.451	0.30
" " " " " urine	traces	traces
Balance of iron	-0.026	+0.01

	Pig I	Pig II
	g.	g.
ingested daily with the maize	0.283	0.283
" " " blood meal.	1.206	1.206
eliminated daily in the faeces	1.483	1.509
" " " urine	traces	traces
Balance of iron	+ 0.006	- 0.020

While all the available evidence makes it extremely improbable that difference in the relative efficiency of these foods is due to the proteins, carbohydrates and inorganic elements are essentially alike in all, and all been subjected to the same amount of heating. But the inefficient lack those components of milk which are separated in the centrifuge or by filtration (cream and any cellular elements) during the preparation of the "protein-free milk". In order to investigate the influence of some of these factors, unsalted butter was added to the diet of rats on "natural" and "artificial protein-free milk". This proved to have the same restoring effect as the milk food, and experiments are now being conducted to investigate the matter more thoroughly.

Sorghum crops, both saccharine and non-saccharine, can be used for silage with good results. The corn plant has considerable prestige as a silage, and has been more generally used for this purpose in Kansas than any other. As in most parts of Kansas the yield of sorghums, such as kafir sweet sorghum, is considerably larger than that of corn (maize), it was thought that if these crops could be made into silage, they would be of particular value.

TABLE I.

LOT. I. — Four cows. — Twenty-day periods.

Period	Milk	Butter fat	Body weight
	lbs.	lbs.	lbs.
1. Corn silage in ration	1 337	55	432
2. Cane silage in ration	1 252	51	432
3. Corn silage in ration	1 178	49	441
Average. — 1st and 3rd periods corn silage.	1 257	52	441
2nd period cane silage.	1 252	51	432
Difference	5	1	

LOT. II. — Four cows. — Twenty-day periods.

1. Cane silage in ration	1 192	54	40
2. Corn silage in ration	1 167	51	39
3. Cane silage in ration	989	46	40
Average. — 1st and 3rd periods cane silage	1 091	51	40
2nd period corn silage	1 167	51	39
Difference.	76	—	

ticular advantage to the farmers and stockmen of the western district where corn is grown with much difficulty and uncertainty. Therefore, two years ago, the Dairy Department of the Kansas Agricultural College planned an experiment to determine the value of sorghums for silage.

The first sorghum crop put into the silo was sweet sorghum, commonly called cane. If the cane is put into the silo three weeks after corn silage is made, it is found that the former does not contain as much acidity as silage. The cane used in this experiment was grown on upland soil on College farm, and the sorghum crop was larger than the maize crop, which occupied part of the same field.

In the following year 1912, one silo was filled with cane, one with corn and one with sorghum; here again the same results were obtained with the sorghum as before. It made a good quality of silage containing less acid than corn silage.

1911-1912 the first feeding experiment was made with milch cows, age being compared with corn silage. Two lots of four cows each were fed for the experiment.

Lot I were fed for the first twenty days on corn silage. For the second ten days (after an interval of 10 days), they were fed on cane silage. After an intervening period of 10 days the third twenty-day period began, when they were again fed on corn silage. The animals in lot II were fed cane silage during the first period, corn silage during the second period and cane silage during the third period. It was planned to get a direct comparison of the two feeds by comparing in each case the average of the first and third periods with the second period. Cows gradually decline in milk yield, and the production of the first and third periods would naturally be about equal to the production of the second period. These cows were fed a grain ration in addition to the silage; the hay ration was kept constant, and a grain ration was fed in proportion to the amount of milk produced, and remained practically constant. The only change, then, in the ration during the experiment was the change made from one kind of silage to the other.

The table on the opposite page gives the results of the experiment. Studying the table of results on lot I, we find an increase in live weight during the cane silage feeding period; this increase is also observed on averages of the first and third periods, while the increase in milk and butter fat production during the corn silage feeding is so small as to be negligible.

Lot II gave similar results. The corn silage produced more milk and fat than the cane silage, while the cane silage caused gains in live weight. The results of the whole experiment suggest that cane silage is more fattening than corn silage.

During the winter of 1912-1913 a feeding experiment was conducted with fifteen dairy cows, in which comparison was made of the respective yields of three crops for silage: kafir, cane and corn. The general plan of the experiment was similar to that of the preceding year. Fifteen cows were divided into three lots. Lot I contained six cows which were used to compare corn silage with corn silage, lot II consisted of five cows fed on cane and kafir silage while in lot III four cows were used to determine the comparative yields of corn silage and cane silage. The cattle in each lot were fed for three periods of 30 days each with a ten-day period intervening between the first and second periods, and also between the second and third periods. The experiment included only the 30 days in each period. Table II gives the results of the second trial.

The results of the experiments in Lot I indicate that corn silage is superior to kafir silage for milk production, while kafir silage proved more fattening.

In the second lot, kafir silage proved much better than cane for milk production. The cows made a very slight gain in body weight while on the cane silage.

In the third lot, corn proved superior to cane silage. The former produced a larger milk yield and a very slight gain in live weight.

TABLE II.

LOT I. — *Kafir Silage versus Corn Silage.*
(Six Cows — Thirty-day periods).

Period	Milk	Butter fat	Body wt
	lbs.	lbs.	lbs.
1. Kafir silage in ration	3 373	142	602
2. Corn silage in ration	3 383	140	594
3. Kafir silage in ration	3 339	139	602
Average 1st and 3rd periods, kafir silage	3 356	140	602
2nd period, corn silage	3 383	140	594
Difference . . .	27	—	—

LOT II. — *Cane Silage versus Kafir Silage.*
(Five cows — Thirty-day periods).

1. Cane silage in ration	2 384	107	41
2. Kafir silage in ration	2 492	112	41
3. Cane silage in ration	2 139	98	41
Average 1st and 3rd periods, cane silage	2 261	102	41
2nd period, kafir silage	2 492	112	41
Difference . . .	231	10	—

LOT III. — *Corn Silage versus Cane Silage.*
(Four Cows — Thirty-day periods).

1. Corn silage in ration	1 953	89	3
2. Cane silage in ration	1 832	86	3
3. Corn silage in ration	1 852	85	3
Average 1st and 3rd periods, corn silage	1 902	87	3
2nd period, cane silage	1 832	86	3
Difference . . .	70	1	—

summing up the work of both trials, the following conclusions may be drawn.

1. Corn silage is slightly superior as a milk producer to silage made from kafir or cane.
2. Kafir silage ranks second as a feed for milk cows.
3. Cane silage ranks third as a milk producer.

In both trials the cattle gained in live weight on cane silage more readily than on silage made from kafir or corn. This fact would indicate that the cane silage contains more carbohydrates and sugar, or fattening substances, than the other feeds. In the writers' opinion, cane silage would prove the equal of corn or kafir silage if more protein and less fat-forming nutrients were added in the grain ration, so that the animal could use the nutrients more efficiently.

Although kafir and cane silage were shown by the experiments to be slightly less valuable than corn silage, there are other factors that must be considered; namely yield and adaptability to local conditions. Without doubt, the greater yield of cane and kafir to the acre will offset the slight decrease in feeding value to be obtained from corn silage. Kafir and cane are drought resisting crops, they can be grown over a wider territory than corn, and yield from one-third to one-half more tonnage to the acre.

During both trials the acidity of the cane silage was never more than that of corn silage. In the second trial the average acidity for the three different kinds of silage was as follows: corn, 2.03 per cent.; cane, 1.46 per cent.; kafir, 1.43 per cent.

It was also noted during the experiment that most of the cane seed and a small amount of the kafir seed passed through the animals undigested. This suggests that the nutritive value of these crops as silage is limited to the stalks and leaves. The quality of silage obtained from all three was very good. The kafir silage was perhaps the poorest on account of its immaturity. The cows eat the silage with relish, and appeared to prefer the cane silage.

The silage was stored in wooden-stave and in cement silos, and kept very well in either case. The time of cutting cane and kafir is all-important in making good silage from these crops. They should be practically mature; that is the seed should be ripe. If cut too green the silage is poor.

After a heavy frost, the crop should be cut and siloed immediately. If it dries out too much, sufficient water should be added to enable it to keep well.

- **Manioc Roots and the Residues of their Elaboration.** — KLING, M. in *Landwirtschaftlichen Versuchsstationen*, Vol. 82, Part 3-4, pp. 211-233. Berlin, July 17, 1913.

From the roots of the manioc (*Manihot utilisima* Pohl) two kinds of flour are obtained, one of which is used as an article of diet, while the other is the starch (*Appreturmittel*) of commerce. Recently, the residues of the starch industry have also made their appearance on the market, especially in the form of cattle feeds.

TABLE I. — *Composition of dried manioc roots.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	11.28	—
Crude protein	1.35	1.32
Crude fat	0.27	0.30
N-free extract	83.27	93.86
Crude fibre	1.98	2.23
Ash	1.85	2.09

TABLE II. — *Composition of the starch made by Messrs. Zwick & Söhne of Neustadt.*

Constituents	Fresh material — per cent.	Dried material — per cent.
Moisture	10.85	—
Crude protein	1.53	1.72
Crude fat	0.38	0.42
N-free extract	83.68	93.86
Crude fibre	1.55	1.74
Ash	2.01	2.26

Manioc is cultivated in the Malay Peninsula, in Africa, in South America, and especially in Java.

The residues of the Javan tapioca, called "tapioka ampas", find their way, like tapioca itself, to the European markets. The tapioca exported from Java in 1907 amounted to 21 000 tons, and in 1907 to 44 000 tons.

The Javan manioc roots which are only suitable for making commercial starch are sent to Germany and used as raw material, chiefly by the firm of Zwick and Sons, of Neustadt a. d. Hardt. The residues of this process appear on the German market under the names of "Stärkefuttermehl" (Starch feeding meal) or "Futtermehl Z" and "Stärkeschlempe". The European feeding-stuffs trade the manioc root residues are also known as "Holländisches Futtermehl", Tapioka-Ampas, "Strumbin", "Stä"

TABLE III. — *Composition of the « Stärkefuttermehl » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material per cent.	Dried material per cent.
ure	10.93	—
protein	3.59	4.03
fat	0.74	0.84
extract	75.95	85.27
fibre	6.10	6.84
.	2.69	3.02

TABLE IV. — *Composition of the « Stärkeschlempe » of Messrs. Zwick and Sons of Neustadt.*

Constituents	Fresh material per cent.	Dried material per cent.
ure	86.56	—
protein	0.25	1.86
fat	0.03	0.22
extract	12.04	89.58
fibre	0.78	5.81
.	0.34	2.53

ill.", "Pflanzenmehl", "Schlempemehl" and "Webco". These
 dues are also often mixed with differend meals used as feeds.

No reliable data existed as to the chemical composition of the manioc
 is, starch-meals, and residues of the roots. For this reason, the writer
 le the analyses given in the accompanying five tables.

The writer has also made a detailed analysis of the composition of the
 tioc roots. When well cleaned, they generally contain a little less moist-
 protein, fibre and ash, but a little more fat and nitrogen-free extract
 n are given in Table I. The analyses show that the roots, like the resi-
 is derived from them, are poor in protein and fat, and that their food
 e depends chiefly upon their starch content. No experimental data are
 liable as to their digestibility. The carbohydrates, especially the starch,
 be "Stärkefuttermehl" ought to be easily digested.

TABLE V. — *Percentage composition of the manioc root residues known as « Stärkeabfall » and « Pflanzenmehl ».*

Constituents	Fresh material		Dried material	
	Stärkeabfall per cent.	Pflanzenmehl — per cent.	Stärkeabfall per cent.	Pflanzenmehl — per cent.
Moisture	10.3	11.68	—	—
Crude protein	1.12	1.25	1.25	1.4
Crude fat	0.12	0.21	0.13	0.2
N-free extract	80.25	76.60	89.46	86.7
Crude fibre	5.62	4.06	6.27	4.6
Ash	2.59	6.20	2.89	7.0

Amongst the residues analysed, the "Stärkefuttermehl" prepared by Messrs. Zwick & Sons possesses the greatest feeding value. The writer puts it at about £7 a ton, that is about the same as potato flakes. If the starch value of potatoes is taken at 77 per cent., that of the "Stärkefuttermehl" would be 70 per cent.

It is recommended to feed this product mixed with substances containing fat and protein and should these be poor in lime, phosphate of lime should be added. "Stärkefuttermehl" should be an especially suitable feed for calves. From the point of view of the dry matter, "Stärkeschlempe" is equal to "Stärkefuttermehl", but it has the disadvantage of not keeping longer than 14 days. The writer recommends "Stärkeschlempe" especially for pigs; it can be mixed with nitrogenous and fatty substances and the containing lime. Wet "Stärkeschlempe" costs about 3s per bushel, a price which nearly corresponds to its actual feeding value, when the cost of cartage is not very high. As for the value of the other similar commercial products what has already been said as regards "Stärkefuttermehl" holds good. Much care is required in purchasing these products, which are often adulterated by the addition of over 40 per cent. of carbonate of lime.

1174 — **The Show of Breeding Stock at Souk-Ahras, Algeria.** — MELLIS, C. *La Revue des Colons de l'Afrique du Nord*, Year 2, No. 23, pp. 362-361; No. pp. 379-383, Algiers, June 1913.

At the second show of breeding stock organized by the Breeders' Syndicate of Souk-Ahras, held in May 1913, a thousand animals were entered of these, 560 were awarded prizes.

The class for pure Tarentais cattle was good; the animals seem not to have lost anything in milk production or general characteristics in their home, though they are somewhat darker and more irregularly marked.

The native cattle were chiefly of the Gnelma breed, common in the mountainous parts; these animals are of a bright gray colour, with body compact and meaty, legs short, chest deep and wide. The cows are fairly milkers; they cross well with Tarentais bulls. The cross-bred Tarentais X native cattle showed a great improvement those of the previous year. Three-quarter-breds are difficult to distinguish from the pure Tarentais; the half-breds too, especially the bulls, show a predominance of the Tarentais blood, being quite distinct from native cattle in the high-set-on tail, wide hips and other characters; bulls at one year may weigh 550 lbs., and at two years 660 lbs. The writer believes this cross will be a success and will keep on improving with careful management and feeding.

Modifications in the Exterior Conformation of the Half-Blood Horse during Growth, in Prussia. — WÖLTLZ, W. in *Landwirtschaftliche Jahrbücher*, Vol. XLIV, Part 3, pp. 409-436. Berlin, May 1913.

It is some time since the writer pointed out the necessity of having measurements made on animals during the period of growth with the object of determining the intensity of development of the several parts of the body. A great number of measurements have been taken, especially on the basis of Lyotin and Nathusius' works and systems, on adult animals, but there is a great scarcity of such data on animals during growth. After mentioning the work done in this connection by Gisler, Pickley, Schröder and Schöttler, the writer reports upon the systematic measurements made by him since August 1908, upon seven half-blood horses of East Prussia, about 6 months old. In August 1909 and 1910 the measurements were repeated upon the same animals. Thus the foals were measured at the successive ages of 6, 18 and 30 months.

Immediately after they were purchased the animals fell sick of glandular inflammation, which for a certain period retarded their development; nevertheless they were well cared for and their food was especially rich.

The measurements were most carefully taken so as to exclude errors in as far as possible.

Some inaccuracies, however, must be considered inevitable, especially certain measurements (thus for instance the length of the neck) which are difficult to take on young spirited horses. But taking an average of figures obtained from seven animals tends to produce a compensation of eventual errors. Especial difficulties were encountered in measuring the length of the fore and hind cannon-bones. The writer measured these bones in the fore limbs starting from the pisiform bone and reaching the sesamoids and in the hind limbs from the point of the calcaneum to the sesamoids. Both measures thus taken exceed the real lengths of the metatarsals and of the metatarsus by about one-third, as they include the carpus in the fore limb and the tarsus with the calcaneum in the hind one. The circumference of the cannon-bone was always taken on the right limb.

The writer gives the results of his measurements in 14 tables, of which the last gives the averages of the 7 foals that were measured, both in absolute

figures and in figures relative to the wither height taken as 100. In the separate columns the percentages of growth of the various parts of the body in the periods of 6 months, 1 $\frac{1}{2}$ years and 2 $\frac{1}{2}$ years are given.

Table I (next page) gives the summary of the data collected.

In two other tables are given respectively the absolute increase in centimetres and the increase per cent. of the various parts of the body. The measurements are arranged in the order of their respective intensity of increase.

The figures given in Table I confirm the well-known fact that foals have in comparison much longer legs and shorter bodies than adult horses, while their chest and pelvis are also comparatively narrower.

It appears also that the lengthening of the body is specially connected with the growth of the barrel, that the length (upper and lower) of the cannon bones increases relatively to the height of the withers, whilst (always proportionately) the length of the cannon bones diminishes and the ratio between the height of the withers, of the back and of the croup remains nearly constant. Always relatively, the dimensions of the body (breadth, depth of chest and width between hip-bones), the length of the shoulder-blade and the girth, and to a slight extent the circumference of the cannon bone, increase. The circumference of the hock diminishes.

In a separate table the writer compares the results obtained by him with half-blood foals from East Prussia with those obtained by Schödtler with Hanoverian half-bloods. These appear more precocious than the former.

The writer then examines the table in which the absolute growth in centimetres is given for the several parts of the body in progressive months.

He notes that the smallest increases are in those measurements that depend particularly upon the increase in length of the cannon-bone. The other measurements follow in the order given in the table, with a maximum for the girth measurement.

Examining the table which shows the data referring to the percentage increase of the several parts of the body that were measured, in the order of intensity of growth, the writer remarks that it varies greatly, ranging from a minimum of 3 per cent. (height at withers) to a maximum of 33 per cent. (width at hip bones). The increase in length of the fore and hind cannon-bones was respectively 6.5 and 6.1 per cent., agreeing with Schödtler's observations on Hanoverian foals, in which he also recognized the slow development of the metacarpus and metatarsus. The other measurements follow in the order set forth in the table. Among others the high percentage of the increases in the length of the neck, of the breadth and depth of the chest, and of the breadth between the hips are noteworthy.

In order to give a graphic demonstration of the foals that were measured the writer has added to his work a plan showing the three outlines corresponding to the average of all the measurements, taken respectively at the ages of 6, 18 and 30 months.

TABLE I.

Measurements	I			II			III		
	Average of measurements of 6 and 7 foals respectively.						Increase compared with measurements of 1908		
	1908	1909	1910	1908	1909	1910	In 1909	In 1909- 1910	In 1908- 1910
	cm.	cm.	cm.	%	%	%	%	%	%
length of body from point of shoulder to point of ischium	120.9	135.4	146.0	96.9	98.7	99.5	12.0	8.7	20.7
length of forequarters	29.6	32.0	34.2	23.8	23.1	23.3	8.1	7.4	15.5
of barrel	53.0	60.6	66.8	42.5	44.2	45.7	14.3	11.7	26.0
of hind quarters	36.5	41.1	44.7	29.3	30	30.5	12.6	9.8	22.4
of pelvis	—	44.5	46.4	—	32.5	31.6	—	—	—
from the pisiform bones to the sesamoids	29.3	30.4	31.2	23.5	22.2	21.3	3.8	2.7	6.5
from the calcaneum to the sesa- moids	41.0	42.4	43.5	32.9	30.9	29.6	3.4	2.7	6.1
length of shoulder-blade . . .	37.9	42.4	46.7	30.4	30.9	31.8	11.9	11.3	23.2
of neck (upper)	54.3	62.5	69.9	43.5	45.6	47.6	15.1	13.7	28.8
" (lower)	36.6	43.5	45.8	29.4	31.7	31.2	18.8	6.3	25.1
of head	—	—	—	—	—	—	—	—	—
height of withers	124.7	137.1	146.8	100	100	100	10.0	7.8	17.8
of back	120.5	133.2	141.5	96.6	97.2	96.4	10.5	6.9	17.4
of croup	127.6	140.9	149.8	102.3	102.8	102.0	10.5	6.9	17.4
of sternum (behind elb- ows)	73.6	77.1	81.8	58.9	56.3	55.8	4.8	6.4	11.2
length of ilium	120.3	131.5	139.5	96.5	95.9	95.0	9.3	6.6	15.9
of ischium	113.7	119.1	124.9	91.4	86.8	85.1	4.8	5.1	9.9
of knee-cap	85.1	90.4	95.5	68.2	65.9	65.1	6.2	6.0	12.2
of hock	56.7	57.4	58.4	45.4	41.9	40.0	1.3	1.7	3.0
height of the shoulder joint . .	93.6	97.5	102.0	75.0	71.2	69.5	4.2	4.7	8.9
of elbow	78.4	81.8	85.6	62.9	59.7	58.2	4.3	4.9	9.2
of pisiform bone	42.5	44.3	46.3	34.2	32.3	31.5	4.3	4.6	8.9
width of chest	51.1	60.7	64.5	41.0	43.8	44.0	18.8	7.4	26.2
at width of chest	29.1	33.1	35.5	23.4	24.2	24.2	13.8	8.2	22.0
width of chest behind shoulders	27.0	32.4	34.7	21.6	23.3	23.7	20.0	8.5	28.5
width within hip-bones . . .	35.7	42.6	47.6	28.6	31.1	32.3	19.3	14.0	33.3
th	133.7	150.4	169.1	107.2	109.7	115.2	cm. 16.7	cm. 18.7	cm. 35.4
circumference of fore cannon bone	15.6	17.5	18.5	12.5	12.9	12.6	1.9	1.0	2.9
circumference of hind cannon bone	17.1	19.6	20.6	13.7	14.3	14.1	2.5	1.0	3.5
circumference of hock	35.0	37.4	38.8	28.1	27.3	26.4	2.4	1.4	3.8

TABLE II.

Numerical order	Measurements	Average increase in relation to the measurements of 1908 was		
		in 1909 cm.	in 1909-1910 cm.	in 1908-1910 cm.
1	Height of withers	0.7	1.0	1.1
2	Length of pelvis	—	1.9	—
3	From the pisiform bone to the sesamoids	1.1	0.8	1.1
4	From the calcaneum to the sesamoids	1.4	1.1	2.
5	Circumference of fore cannon-bone	1.9	1.0	2.
6	" " hind " "	2.5	1.0	3.
7	Height of pisiform bone	1.8	2.0	3.
8	Circumference of hock	2.4	1.4	3.
9	Length of fore hand	2.4	2.2	4.
10	Front breadth of chest	4.0	2.4	6.
11	Height of elbow	3.4	3.8	7.
12	Breadth of chest behind shoulders	5.4	2.3	7.
13	Length of hind hand	4.6	3.6	8.
14	Height of sternum	3.5	4.7	8.
15	Height of shoulder joint	3.9	4.5	8.
16	Breadth of shoulder-blade	4.5	4.3	8.
17	Length of neck (lower)	6.9	2.3	9.
18	Height of knee-cap	5.3	5.1	11.
19	" of ischium	5.4	5.8	11.
20	Breadth between hip bones	6.9	5.0	11.
21	Depth of chest	9.6	3.8	11.
22	Length of barrel	7.6	6.2	11.
23	Length of neck (upper)	8.2	7.4	11.
24	Height of ilium	11.2	8.0	11.
25	" of back	12.7	8.3	2.
26	" of withers	12.4	9.7	2.
27	" of croup	13.3	8.9	2.
28	From point of the shoulder to point of ischium	14.5	10.6	2.
29	Girth	16.7	13.7	3.

TABLE III.

Measurements	Average increase in relation to the measurements of 1908 was		
	in 1909	in 1909-1910	in 1908-1910
	%	%	%
Height of hock	1.2	1.8	3.0
From calcaneum to sesamoids	3.4	2.7	6.1
From pisiform bone to sesamoids	3.8	2.7	6.5
Height of shoulder joint	4.2	4.7	8.9
" of pisiform bone	4.3	4.6	8.9
" of elbow	4.3	4.9	9.2
" of ischium	4.8	5.1	9.9
" of sternum	4.8	6.4	11.2
" of knee-cap	6.2	6.0	12.2
Length of fore hand	8.1	7.4	15.5
Height of ilium	9.3	6.6	15.9
" of back	10.5	6.9	17.4
" of croup	10.5	6.9	17.4
" of withers	10.0	7.8	17.8
From point of shoulder to point of ischium	12.0	8.7	20.7 ¹
Front width of chest	13.8	8.2	22.0
Length of hind hand	12.6	9.8	22.4
" of shoulder-blade	11.9	11.3	23.2
" of neck (lower)	18.8	6.3	25.1
" of barrel	14.3	11.7	26.0
Depth of chest	18.8	7.4	26.2
Breadth of chest behind shoulders	20.0	8.5	28.5
Upper length of neck	15.1	13.7	28.8
Breadth between hips	19.3	14.0	33.3

1176 - Cattle Breeding and its Importance in German East Africa. The various Breeds of Cattle. — LICHTENHELD, G. in *Der Tropenpflanzer*, Year 17, No. pp. 405-430. Berlin, August 1913.

The 2 300 000 head of cattle in German East Africa are very unequally distributed. About one-third of the Protectorate is unsuitable for cattle owing to tsetse, and much of the rest is not utilized.

All the cattle, with the exception of some animals imported from Europe, are zebus. They mostly belong to *Bos zebu africanus*, but some to *B. z. indicus* (called Sokotra cattle by the writer). Among the African zebu the writer draws a distinction between those with large horns and small humps (Watussi, numbering 750 000) and those with small horns and large humps (Masi, 1 500 000).

I. *The Masai zebu*. — Bred chiefly by the Masai tribe. Colour usually red or yellow and brown, but frequently black or white and grey. Pigmentation generally dark, rarely similar to the coat colour. Skin thick and coarse; hair smooth, short, with a silky lustre. Head small, often hornless, but frequently with short, stout horns bent slightly upward. Face slightly dished. Ears medium-sized, directed sideways and slightly backwards. Neck of medium length, with the dewlap usually much developed. Withers wide; hump 12 inches high, and usually more developed in the male than in the female. Shoulders sloping and muscular. Croup relatively deep, occasionally somewhat flat. Body barrel shaped. Ribs and loins of medium length and in a straight line. Croup weak and sloping. Haunches very fleshy. Limbs short, but with small, regular bones. Legs are sometimes crooked, but to no great extent. Tail set on rather low, long and thin, with a large tuft. Hoofs small, hard, and varying in colour from grey to black. Udder small, fleshy, almost hairless, with small fleshy teats. The size of the animals varies in different localities and attains an average of 4 ft. 3 in. to 4 ft. 7 in., sometimes 5 ft. or 5 ft. 6 in. height. The best developed animals are usually found in the hot dry districts while the less developed occupy the lower ground.

The Masai zebu matures late; cows do not come into heat until the age of 2 ½ years. The bulls and cows are full grown between 3 ½ and 4 years, but steers may go on developing until they are 6 years old.

The Masai zebu is a thrifty animal, and very resistant to weather and disease. The calves are subject to Texas fever, which is prevalent throughout the Protectorate and causes 1 per cent. loss, if the animals contract it during the first months of their life. If the disease appears later, the losses can amount to 20 per cent or over. The same occurs in the case of anaplasmosis. Coast fever, in the districts where it is endemic, is responsible on an average for the death of 30 per cent. of the calves; the remainder enjoy life-long immunity; but if this disease is introduced into a hitherto healthy herd, it may carry off 90 per cent. The number of cattle attacked by tuberculosis is estimated by the writer at under 1 per thousand.

The Masai cows calve regularly every year. Calving is usually normal, no assistance being needed, and it is followed by no bad after-effects.

production is normally below 70 gallons per lactation period, but favourable conditions may be more.

The beef production of a two-year-old steer is easily over 220 lbs.; of 5 years of age give up to 440 lbs. of beef, and those of 7 years up to 480 lbs. The weight of the hump can attain 24 lbs. The meat contains coarse fibres and is less marbled than that of European breeds. The fat accumulates chiefly below the skin and round the viscera. These zebu are satisfactory draught animals.

I. *The Watussi zebu*. — These are only bred by the Watussi tribe, and are a little smaller than the previously mentioned animals. Coat is red, brown or yellow. Head and horns longer than in the Masai.

Chest deep, but flat. Line of back and croup straight. Legs often weak. Milk production twice as large as in the case of the Masai type, but meat production poorer. The animals are less resistant to epidemics of other forms of disease than the Masai zebu; they cannot stand short of water or want of water as well as the latter. These faults recur in crosses between the two types. The Watussi are also less fertile and develop more slowly than the Masai zebu.

II. *The Sokotra zebu*. — These were introduced direct from India by the Arabs and are much appreciated for their good milking qualities, and are especially suited to the coast zone, and will, in the opinion of the writer, be still more popular in the future.

IV. *Cattle keeping and breeding by the natives*. — Most of the tribes keep their cattle in the open, but some give them shelter at night. The calves are only put with their mothers for suckling. As the natives milk the cows the calves generally suffer from under-feeding. The large and small domestic animals do not graze together. During the rainy season, or a short time after, the animals are at grass for some hours; during the dry season, they remain in the field all day. When the natural supplies of water are exhausted, the natives dig wells to obtain drinkable water. In some districts where water is scarce, the animals are fed during the dry season on succulent banana stems. One stem daily is considered sufficient for an animal in the cow-house. The natives have no idea of making hay, or of storing fodder for times of dearth. When the grass of the pasture becomes scanty, the native sets forth in search of fresh fields, and sends some of his cattle into good grazing districts, paying in return for the pasturage the milk produced by the cows during their stay.

As a rule, the bulls used for breeding purposes are selected. They are usually chosen for shape, colour and maternal descent, the offspring of good milkers being given the preference. Unsuitable animals are castrated. The proportion of bulls ready for service is about 1 to every 20 cows. The bulls are chosen for their good milking properties. A well-proportioned bull may be worth as much as three bullocks. As the natives use all the cows for breeding the herds become very heterogeneous. According to the writer, there is no selection of cows for breeding, for the idea is to use the best available animals, and thus increase the size of the herds as much as possible. In order to avoid in-breeding, the native exchanges his breed-

ing animals with those of other cattle owners. The Masai zebu are crossed with the Watussi, but the offspring produced by crossing these types with the Sokotra zebu enjoy equal favour. Most of the native tribes still refuse to introduce into their herds European cattle or their hybrids.

V. *Cattle keeping and breeding by Europeans.* — The methods adopted by the Europeans differ little from those which obtain amongst the natives. The chief aim of the European breeders is to have as large herds as possible. As a rule, their herds are less valuable than those of the natives, which is more to be regretted as they import many bulls from Europe. The writer thinks that it would be best for the European graziers to begin improving the native breeds before trying to introduce European blood. It has been found that European cattle and their crosses have little power of resisting the climate and the diseases peculiar to the country. It is true that some success has been attained recently in rendering European cattle immune from the most serious diseases, such as anaplasmosis and Texas fever, but for various reasons, immunisation cannot be practised generally. European cattle if introduced should, according to the writer, be kept in the cowsheds.

Alongside of ordinary farms, where, as on those belonging to the natives, the chief attention is paid to meat production, there are also some dairy farms in the Protectorate. The milch cows on these farms are Sokotra or of European breeds; they are always kept in the stall, and receive in addition to grass and hay "mogo" (1) and oil cakes.

VI. *The value and importance of the cattle.* — The price of a steer weighing 440 lbs. of beef varies from 25s to 90s according to locality. Cows fetch a quarter or half as much again.

At Daressalam a gallon of milk costs 2s; at other places its price is between 2 1/2d to 10d. One pound of fresh butter costs about 3s at Daressalam, 1s 6d at Moschi; 11d at Iringa. One pound of "sami" (2) costs 3d at the chief places of export.

Until lately, the cattle of German East Africa have been chiefly important as providing food for the native breeder, whose prosperity depends for the most part upon his herds. Recently, however, they have also begun to supply the plantation workers and the town populations. Last year about 12 000 oxen were sent for slaughter to the districts of Tanga and Helmsdal. On the other hand, the writer estimates the number of animals which annually find their way to the market at over 40 000. Considering the small amount of business, and the low price of meat, there is no question of the rational utilization of the cattle. In all breeding districts the overproduction of beef-producing animals is noticed. The writer considers that the best means of preventing a crisis in this direction would be the establishment of factories for canning meat and preparing meat extract.

The number of cattle exported from the Protectorate was 545 in 1910, 240 in 1911, and 179 during the first half of 1912. As regards "sami"

(1) This is a tuber of which the feeding value is about equal to that of the potato.

(2) Native-made melted butter.

300 lbs. were exported in 1910, 659 500 lbs. in 1911, and 399 600 lbs. in the first half of 1912.

The duty on exported cattle amounted to about £17 000 in 1910, £19 350 in 1911, and £10 350 during the first half of 1912. The small numbers exported are partly due to the prohibition of the importation of cattle into neighbouring colonies (except Zanzibar and the Congo) and the law forbidding cows being exported from the Protectorate. As draught animals and producers of manure, the cattle in question are of no interest.

VII. *Methods of improving cattle-breeding.* — The writer is of opinion that it would be worth while to improve the breeds of cattle in German East Africa. In order to do this it would be necessary to improve the management of the animals, abandon the practices which lead to the underfeeding of the calves, not allow the heifers to be served by the bull at such early age, and diminish the size of the herds kept in districts poor in forage. Hay should also be grown on the farms kept by Europeans, and maize, potatoes, lucerne, etc., cultivated on dairy farms. A better selection of stud animals is very desirable; in-breeding should be avoided, and only immune animals used in districts where coast fever is prevalent.

The writer advises crossing native and European cattle only for the purpose of improving the milk production, and considers that such crossing should be practised by the European farmers exclusively.

The article is illustrated with pictures of the animals.

17. **Welsh Black Cattle.** — SABORSKY, PAUL in *Mitteilungen der Landwirtschaftlichen Lehranstalt der k. k. Hochschule für Bodenkultur in Wien*, Vol. 1, Part 4, pp. 511-585, Vienna, May 8, 1913.

In a section of his comprehensive work, the writer gives an account of the range of the Welsh Black Cattle and of cattle breeding and agriculture generally in Wales. He then passes on to describe the nature of the animals and coat of the above-mentioned cattle. In section III are given the external measurements of 90 of these animals.

The writer has taken skull measurements according to the Adamczewski method. The measurements of 15 typical skulls, of which two are of the North Wales type, are given in section IV. Attention is here drawn to the differences between the two types, which consist chiefly in the form and course of the supra-orbital canals and the lachrymal bone, as well as in the size of the angle of the interparietal bone, the length of the temporal bone and of the occiput. The mandible, the palatine, the nasal, and the zygomatic bones in both types show indication of descent from a *brachyceros* type, while the maxilla recalls that of *Bos primigenius*. The skulls from North Wales show more signs of *primigenius* descent than do those from the South part of the Principality. The writer concludes from the measurements that both types are nearly related, but owing to the great differences in the skulls, he thinks they should be regarded from the agricultural standpoint as independent race types. A mixed origin is unlikely. It is certain that the Welsh black cattle, like other old British breeds, are descended from a specific wild type, perhaps a variety or a subspecies of

Bos primigenius, and thus occupy a special position in the stock-breeding system. From the combination of *primigenius* and *brachyceros* characters in the skull, the writer classifies this breed as *pseudoprimigenius*.

1178 - Carcase Test of the Piedmontese Breed of Cattle - MASCHERON, E. *Cronaca Agricola*, Year XVIII, No. 12, Turin, July 1, 1913.

Though the Piedmontese cattle are considered a general purpose breed (meat, milk and work), nevertheless as producers of meat they are doubtless among the best Italian breeds, if not perhaps the best of all. Formerly this breed contributed largely to the exportation of cattle to France and Switzerland.

The Piedmontese cattle mature early; frequently it is found that at the age of 18 or 20 months animals of this breed weigh 1320 lbs. and upward and at the age of four years considerably above 2200 lbs. The meat is of excellent quality. The animals are easily fattened without much expense and the percentage of dead weight is high.

Doctor Poli, chief of the Municipal Veterinary Office of Turin, was entrusted by the Ministry of Agriculture, in 1887, with the task of determining the net carcase weights of Piedmontese cattle; from observations made by him it appears that of 31 head of cattle taken at random, 14 gave dead weight percentages ranging between 49 and 55, and 17 above 55; of the latter 9 were above 60 and one reached 66.

1179 - The Correlation between the Percentage of Milk Fat and the Quantity of Milk Produced by Ayrshire Cows. - *Journal of the Board of Agriculture*, Vol. XX, No. 5, pp. 447-448. London, August 1913.

An investigation was undertaken by the Board of Agriculture owing to a desire for figures showing as definitely as possible the extent of the correlation between the quantity and quality of milk yielded by a cow. The work of preparing a report on the subject was entrusted to Mr. H. D. Vig, an Assistant to the Head of the Statistical Branch of the Board. It was thought desirable to include in the calculations such other variable factors as might affect the milk yield of the cow and the percentage of fat contained in the milk, and for this reason it was decided to deal also with the age of the cow, the duration of lactation and the date of calving. The conclusions are derived from data contained in a Report of the Ayrshire Cattle & Records Committee.

The conclusions drawn are:

- 1) After allowance has been made for the varying age and duration of the lactation period of the Ayrshire cows under examination, the use of cows which gave the larger average weekly yields of milk shows a definite and appreciable tendency to be poorer in milk fat than the milk of cows which gave lower average weekly yields.
- 2) The duration of lactation had no significant influence upon the average percentage of milk fat produced.
- 3) The percentage of milk fat showed a slight, but definite, tendency to be lower in the older than in the younger cows, after due allowance had been made for the average weekly yield of milk.

4) Taking the herd as a whole, the duration of the lactation bore no relation to the average weekly yield of milk produced by cows. There is no evidence in the case of these cows, of a selective action in favour of milking in milk those cows that gave a better average yield of milk than the others.

5) In the herd under examination, the older cows show a definite appreciable tendency to give larger yields of milk than the younger ones. This may possibly be due partly to a selective action in weeding out cows which proved unpromising as regards their milk yield when young, partly to a physiological tendency for older cows to give better yields than younger ones.

6) The duration of lactation has possibly tended to be longer in older cows than in younger cows, although the evidence on this point is not quite definite.

If it is supposed that the average age and duration of lactation remain unaltered, it appears possible to select a herd with an average yield of nearly 500 gallons per cow per lactation (as compared with the 1909 average yield of 437 gallons), without reducing the average percentage of milk fat produced in the herd as a whole below 3.58 per cent., as compared with the present average of 3.68 per cent. It must be borne in mind, however, that while this result may be regarded as the most probable, in the long run the certainty of attaining it diminishes when only a small number of cows is being dealt with, and increases proportionately with the number of cows in the herd in which the policy of selecting cows with higher milk yields is pursued.

- Investigations into the Daily Variations in the Specific Gravity and Fat Content of the Milk of a Large Herd (1). Klose in *Bericht über die Tätigkeit des landwirtschaftlichen Instituts zu Proskau für das Jahr 1912-13*, pp. 11-12. Oppeln, 1913. *landwirtschaftlichen Zentralblatt*, Year 42, Part 13, pp. 385-392. Hanover July 1, 1913. In March, May, July and October, 1912, the writer investigated the specific gravity and fat content of the milk of 70 cows belonging to the herd of the Proskau Dairy Institute. Tests were made thrice daily. These cows were selected, as it was important that the period of investigation should include months during which the food was qualitatively the same, and others when the rations varied. The cows' rations in March consisted of straw, brewer's grains, and sunflower and sesame cakes.

In May, the animals received nearly the same food as in March for three weeks, and then were put out to grass until the end of July. From the 6th of October, the cows grazed half the day, and until October 17, when they were moved to the shed, they were given grains, linseed cake, mangolds, straw and hay. From the 17th to the 25th of October the linseed cake was replaced by sunflower cake, and from the 25th to the 31st crushed barley was substituted for concentrated food.

(1) See No. 298, B. March 1913.

The daily variations in the milk content of each milking (morning, noon and evening), and the variation in the content of each day's milk (the arithmetical mean of the milk of the morning, noon and evening milkings) are given in tables. If the results of the different months are compared, it is seen that the greatest variations in the content occurred in the two months March and July, when there was no change in the rations. While in March 18.9 per cent. of the single milkings and 3.3 per cent. of the daily milkings showed a variation in fat content of from 0.2 to 0.45 per cent., in July 34.4 per cent. of the former and 23.3 per cent. of the latter showed variations of the same amounts. The greatest variations in fat content were in July, when they reached 0.7 and 0.35 per cent. for single milkings and the day's milk respectively; in March, the highest variations were 0.45 and 0.16 per cent, respectively. In May, the highest variation in the fat content of the single milkings was 0.7 per cent, and that in the day's milk 0.25 per cent. In October, the highest variation in the single milkings was found to be 0.5 per cent, and that in the day's milk 0.26 per cent.

The number of variations in the single milkings were: 17 in March, 27 in May, and 31 in July and October respectively. The greatest variations in fat content in the day's milk occurred in July (during the full grazing season). Next come October and May (when the rations were varied). The day's milk showed least variation in fat content in March (when the rations were always similar).

In glancing over the variations in specific gravity, the similarity of the returns for March and October (when the cows were mostly stall-fed) and those for May and July (when the cows were mostly at grass) is very striking. In March and October, 10 per cent. of all the single milkings varied in specific gravity more than 1 lactodensimeter degree in 24 hours (highest variation 1.9 degree). In May and July, the number of single milkings which attained this amount of variation (highest variation 3.7 degrees) reached 33.3 and 31.1 per cent respectively. In spite of these numerous and large variations in the single milkings, the fat content of the daily milk showed a considerable adjustment of the differences.

The greatest daily variation of specific gravity was in July (0.0037) the smallest in October (0.0015). In March and May the variations did not exceed 0.002. The highest variations which occurred on change of rations were on an average:

Periods	Variations in fat content	Variations in specific gravity (lacto densi- meter degrees)
May 4-7	0.45	1.2
Oct. 6-8	0.30	0.8
Oct. 17-19	0.25	1.0
Oct. 25-27	0.50	1.1

It is thus evident that the variations in fat content and specific gravity were not much greater when the rations were changed. The writer concludes that the current idea that the variations in fat content of the milk of a lactating cow are due to changes in the rations is not supported by the facts.

d on approximately similar rations are small, is a fallacy, and that ing for adulteration, as much stress must be laid upon alterations in specific gravity of the milk as upon the variation in the fat content. The writer does not consider that fat content variations of 0.2 per cent even up to 0.3 or 0.4 per cent, are alone sufficient to prove adulteration, but they must be accompanied by a difference of 0.002 or more in specific gravity. In passing judgment upon milk from the examination sample taken in the shed, the alteration in the specific gravity is the point to be noticed. Repeated fat determinations constitute the method of judging milk from the butter-making point of view.

The Possibility of Increasing, with Economic Advantage, the Average Content of Cow's Milk. — HANSSON, Nils in *Kungl. Landbruks-Akademiens Årbok och Tidskrift*, Year 52, No. 5, p. 289. Stockholm, 1913.

Among the components of milk, fat is the most valuable, both when milk is as such and when it is used for butter or cheese making; thus the eco-

Schematic diagram showing the composition of the dry matter of milk for different fat contents (as abscissae).

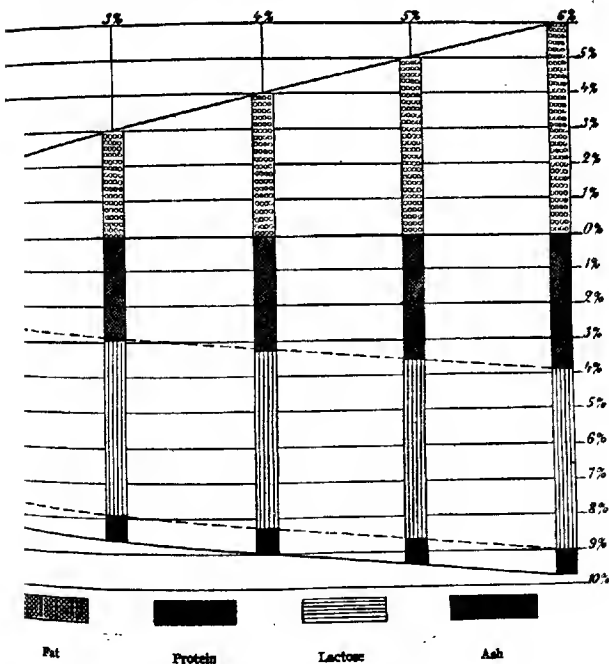


TABLE I. — *Average composition of the dry matter in milk.*

Fat in milk	Solids not fat in milk	Total solids in milk	Fat in the total solids	Solids not fat for 100 of fat
%	%	%	%	lbs.
2.00	8.31	10.31	19.4	415
2.25	8.46	10.71	21.0	376
2.50	8.51	11.01	22.7	341
2.75	8.57	11.32	24.3	312
3.00	8.72	11.72	25.6	291
3.25	8.83	12.08	26.9	272
3.50	8.96	12.46	28.1	256
3.75	9.05	12.80	29.3	241
4.00	9.16	13.16	30.4	229
4.25	9.29	13.54	31.4	218
4.50	9.30	13.80	32.6	207
4.75	9.30	14.05	33.8	196
5.00	9.33	14.33	34.9	187
5.25	9.37	14.62	35.9	179
5.50	9.36	14.86	37.0	170
5.75	9.34	15.09	38.1	162
6.00	9.31	15.31	39.2	155

nomie importance of producing cheaply a milk rich in fat will be perceived at once.

Without waiting for the theoretical solution of the problem, for last quarter of a century attempts have been made in Sweden to realize it in practice. The writer, who is chief of the Animal Husbandry Station of the Central Agricultural Experiment Station of Sweden, discusses in this paper the circumstances which exert an influence on the result and gives a résumé of what has been obtained up to the present.

In comparing the numerous analyses of milk that have been made the course of feeding experiments carried out during 13 years at Bonn those that were made at Tranekjaer and Bregentved in Denmark, the writer found that the composition of the dry matter in milk varies very regularly with its fat content, independently of the breed of cow, of the time el-

LE II. — Food required to produce milk richer or poorer in fat, calculated according to the composition of the milk. Average yearly production 3 300 kg. (6600 lbs.) of milk per cow. Live weight 450 kg. (990 lbs.).

wt that of milk %	Food requirement of cow per year — Food units	Food requirements for the production of				
		1 kg. of fat — Food units	100 kg. of milk — Food units	1 kg. of dry matter of the milk		
				Ration of production — Food units	Ration of upkeep — Food units	Total — Food units
50	1 909.0	25.5	63.6	2.46	3.32	5.78
75	1 955.9	23.7	65.2	—	—	—
90	2 002.0	22.2	66.7	2.58	3.11	5.69
25	2 048.7	21.0	68.3	—	—	—
50	2 095.0	20.0	69.8	2.68	2.93	5.61
75	2 145.5	19.0	71.4	—	—	—
90	2 188.0	18.2	72.9	2.77	2.77	5.54
25	2 234.5	17.5	74.5	—	—	—
50	2 281.7	16.9	76.1	2.86	2.65	5.51
75	2 329.1	16.3	77.6	—	—	—
90	2 376.4	15.8	79.2	2.98	2.55	5.53
25	2 423.3	15.4	80.8	—	—	—
0	2 471.0	15.9	82.4	3.09	2.46	5.55

calving, and of the feeding. This is shown by the accompanying diagram and by the figures of Table I, which give the composition of the total in milk, and according to which the solids not fat increase with the content, but to a lesser extent.

This increase concerns almost exclusively the protein content, which is one-quarter of the total solids; it does not affect either the lactose or ash, the quantities of which, according to the analyses used, are always constant relatively to the quantity of milk, namely about 10 per cent. of lactose, and 0.7 per cent. of ash.

This signifies that the richer a milk is, the less does the production of solids not fat influence the production of fat.

Taking these ratios of the components of milk as a basis, the influence of the fat content of the milk on the food requirements of the cow has been calculated.

TABLE III. — Consumption of food for the production of 1 kg. of milk

Average fat content of milk of the herds %	Food units per 1 kg. of fat	
	Southern provinces Malindi	Central provinces
2.80 — 2.89	(25.6)	—
2.90 — 2.99	23.4	—
3.00 — 3.09	22.4	—
3.10 — 3.19	21.5	21.5
3.20 — 3.29	21.1	20.8
3.30 — 3.39	20.5	20.1
3.40 — 3.49	20.4	19.7
3.50 — 3.59	19.8	19.3
3.60 — 3.69	19.9	18.7
3.70 — 3.79	18.0	18.5
3.80 — 3.89	17.8	18.4

According to the standard of feeding of cows established by the milk control societies, on the basis of the results obtained by the milk control societies, cows require one food unit for the production of 6.6 lbs. of milk. Supposing this standard refers to the production of a milk containing 3.5 per cent. of fat the food required for the production of milk having another fat content has been calculated by valuing the proteins and lactose as fat according to their calorific value and supposing, with Kellner, that 0.55 lb. of fat corresponds to 2.2 lbs. of starch value (= 1.65 Swedish food units). The result of this calculation (see Table II) is that for the production of 2.2 lbs. of milk the food requirements of the cow diminish, but following a decreasing ratio, with the increase of the fat content of the milk. For the production of 220 lbs. of milk, this requirement increases following a continuous ratio of about 1.5 food units for 0.25 per cent. of the increase of fat content.

This increase of consumption of fodder does not seem to be connected with the quantity of total solids. On the contrary this ratio is almost constant, for if the quantity of fodder required for the production of a certain quantity of solid be divided into its two parts (ration for upkeep and ration for production), it will be found that the increasing amount of fodder required for production, which depends upon the greater calorific value of the fat compared with that of the other components of milk, is balanced by the decreasing quantity required for upkeep distributed over the total solids produced.

This theoretical deduction is further checked by an investigation on the results of the milk control societies. This investigation was made with the

showing the difference in the consumption of fodder for the production of 1 kg. of fat and of 100 kg. of milk of varying richness. Table I gives the figures for the controlled herds of the most southern and those of the three central provinces in separate columns, the consumption of fodder separately for each herd.

The results are grouped according to the average fat content of the milk. The figures for 2.75 to 3.75 per cent. of fat correspond as well with Table II as among themselves, especially if it be considered that the figures of Table II are calculated for cows weighing 450 kg. (990 lbs.) and exactly 3000 kg. (6600 lbs.) of milk, whilst the figures of Table III are for cows of varying weights and yields. In this table the figures for the poorest and of the richest milk are based on so small a number of cows as to have very little value.

The practical results of the control societies thus show, by their agreement with the theoretical deductions, that fat may be produced with a much smaller consumption of fodder in rich milk than in the poorer milk. If the fat content is increased from 3 to 4 per cent., the consumption of fodder per kg. of fat is reduced by 4 to 4.5 units, that is by about 1.8 per cent. The quantity of food necessary for the same production in milk containing 4 per cent. of fat. The very small diminution of solids not fat relatively to the quantity of fat which thus results from the increase of the fat, has next to no importance economically owing to the low value of these components. An increase in the fat content of milk leads to considerable profit as where milk is used for the manufacture of butter or where it is sold according to its real value. But for the very frequent cases in which the price of milk is fixed independently of its fat content, it becomes important to know if the production of fat milk requires more fodder than that of lean milk. In order to resolve this question, the writer compared groups of cows yielding milk of different fat content; he has arrived at the results that the consumption of forage per kg. of milk grows proportionally to the fat content. The calculation of this ratio has yielded somewhat different results, but it may be admitted as an average that an increase of 1 per cent. of fat corresponds to an increase of 6.3 food units in the production of 100 kg. of milk, which agrees with the figures of Table I. For a butter which is paid 2 kroner per kg. (1s 10d) this increase of 6.3 units of fat in 100 kg. of milk is worth nearly 2.2 kr. (2s 5d), but 6.3 units of food are worth less than 0.7 kr. (9¼d). It is thus proved that the greater the food required for the production of a richer milk does not increase about 30 per cent. of that of the fat content of the milk. It is thus proved that it is not the case when the increase in the fat content of the milk is obtained at the expense of the average quantity of milk, because it is only upon this that the cost of the production of milk depends. After having thus treated of the advantage of an increase in the fat content of milk, the writer reviews the means to be adopted to obtain it and the results which have been hitherto achieved in Sweden. It has been proved, that certain kinds of food, such as palm and coprah cakes and

the leaves of beets, have a tendency to increase the fat content of the milk produced, whilst others, such as poppy and German sesame oil and inferior rice flour, act in the opposite way. Nevertheless it is by feeding that sure progress is to be expected, but by selection in breeding with this object in view.

This truth has long been recognized in Sweden, but even now the progress has been in general but slight, whilst in Denmark it is very marked. The writer nevertheless mentions some Swedish herds in which a decided progress has been noted during recent years, as is proved by the figures of the breeding centre competitions (1). One herd especially, of Alberga, of Ayrshires, gives a good example and unassailable proof of the manner in which this progress has been realized.

The writer mentions the Kolle-Kolle herd in Denmark as a fine example of the influence that a bull may have by the capacity of transmitting to the female line a high productiveness of milk rich in fat. The writer gives a list of the bulls most employed for the development of the Friesian breed in Sweden, with notes on the production of milk and butter in the daughters of these bulls as compared with the production of their dams. He demonstrates that most of these bulls have transmitted to their daughters a productiveness greater than that possessed by their dams. On the other hand, some of them have exercised a contrary influence upon the quality of their descendants.

In order to demonstrate the practical possibility of increasing the production of butter fat by means of the selection of the breeding animals, the writer gives a summary of the development of the Alberga herd and the choice of the bulls that were used. Thanks to the determination of the quantity of milk and of its fat content made regularly since 1899 on all the cows of the herd, it has been possible to calculate separately the production of milk and of fat for the groups of descendants of each bull of each cow.

As for the bulls, five have had a remarkable influence on the development of the herd. If the cows are distributed in families according to the bulls that were their sires, or paternal grandsires, a great difference in the average quantities of milk and butter fat of the different families will be seen. But in order to establish with certainty the influence of each bull upon his offspring, it would be necessary to compare separately the production of each of his daughters with that of their mother, making such comparison at the same age, that is to say for the lactation periods following the first, second, third, etc., calving. In this manner the influence of the normal increase in production during the first lactation periods would be eliminated.

This comparison has been possible for only two of the Alberga bulls. For the other three bulls only the average figures for all the years of production of their daughters and of the dams of these were available.

(1) For the definition of the breeding centre competitions in Sweden, see E. WANDER'S original article: "The Development of Cattle Breeding in Sweden," published in this *Bulletin*.

TABLE IV.

Names of bulls	Number of daughters	Controlled during years	Sum of years of control	Average yields		
				Milk kg.	Fat %	Fat kg.
S	61	5.92	361.12	2 545.1	3.70	94.17
.	61	3.59	218.99	2 347.3	3.59	84.31
				+ 197.8	+ 0.11	+ 9.86
IS	69	3.78	260.82	2 863.6	3.78	108.31
.	69	3.61	249.09	2 535.1	3.61	91.64
				+ 328.5	+ 0.17	+ 16.67
W's Joy.						
MS	26	4.54	118.04	2 811.0	4.01	112.76
.	26	3.70	96.20	2 537.1	3.70	93.92
				+ 273.9	+ 0.31	+ 18.84
MS	11	—	37	3 470.1	3.90	135.35
.	11	—	37	2 780.5	3.72	103.47
				+ 689.6	+ 0.18	+ 31.88
V.						
MS	15	—	30	2 672.6	4.30	115.01
.	15	—	30	2 914.2	3.90	113.58
				— 241.6	+ 0.40	+ 1.43

These results of the comparison are shown by the figures of Table IV. Five of the increase (+) or the decrease (—) of the production of the milk of each family compared to those of their dams.

Five of the five bulls have all of them caused an increase of the fat content of the milk, and four of them have also caused an increase in the quantity of milk produced, but from this point of view the fifth has caused such a decrease that the progress in the production of fat has been almost nil. Nevertheless, in order to be just in the verdict on the value of a bull for breeding purposes, the productiveness of the cows with which he is mated must be observed. The higher this was, the more difficult it became for

the bull to raise it still higher. The writer has illustrated this fact by grouping the dams of each family of a bull according to the fat content of the milk. From this grouping it appears that the poorer the milk of the dam, the more could all the bulls cause the fat contents to rise. In the group in which the milk was richest two of the bulls have caused the fat content to sink. A bull may thus act favourably on the average fat content of a herd and exert an unfavourable action in another herd in which the faculty of yielding a rich milk is more developed.

Calculating the average fat content of the milk of all the descendants of a bull, the writer has determined the fat content that this bull represents and which he can transmit as inheritance. He calls it "genotype fat content percentage" of the bull.

The writer summarizes as follows the results of his investigations on the influence that the choice of the bulls has on the fat content of the herd.

1. It is possible to increase the percentage of fat content of the milk of a herd, with economic advantage, by a judicious selection of the breeding animals.

2. By dividing a herd into families of descendants of the sires and the dams, the influence of each animal on the development of the quality of the herd may be better demonstrated.

3. The influence of the males is demonstrated by the average production of all their female descendants, or still better by a comparison of the average production of their daughters with that of the dams of these daughters when they were of the same age.

4. The influence of the bulls on the percentage of fat content of the milk of their female descendants depends upon the qualities of the females of the preceding generations.

5. The influence of the cows appears in the fact that a bull possessing a certain genotype percentage of fat cannot increase the percentage of fat in the milk except in the daughters of cows inferior to him in the percentage of fat content, whilst the daughters of the same bull out of cows yielding richer milk will have a percentage of fat inferior to that of their dams.

6. The males and the females transmit to their descendants the percentage of fat which they themselves have inherited from their ancestors. The male and the female having, as it appears, an equal influence on the fat content of the milk, that they represent the same constancy of results in this respect. But, owing to its larger number of descendants, the male has a greater influence on the development of the herd.

7. Nevertheless, as is usually the case in questions of heredity of quantitative characters, variations are frequent, so that some particular sires may have an average fat content percentage very different from that of the sire or of the dam; but the average percentage of all the descendants is in general very near to the average genotype percentage of fat content of the sire and of the average fat content of the dam's milk.

8. For the improvement of animals, as well as for that of plants, it is sought to unite the qualities having the greatest practical value; and the effort towards the attainment of such a high yield of milk as would

ous to the health of the animals must be carefully avoided, as well as figures in the butter fat content. But everywhere where milk is according to its quality, the object in view should be to combine the in these two directions in order to attain a high production of fat.

The principal means of increasing the fat content of the milk is a scrupulous selection of the breeding animals, especially of the bulls, judging the type percentage of butter fat according to: a) the average percentage milk of their dams, grandams and sisters; b) the influence of their sires and sires on their daughters; and, when the bulls are sufficiently old, their own influence on the average percentage of butter fat in the milk of their female descendants.

The Improvement in Sheep-Breeding in Algeria. — COUSTON, F. In *La Revue des Colonies de l'Afrique du Nord*, Year 2, No. 31, pp. 488-490. Algiers, July 31, 1913. The official statistics give a total of 9 million sheep for Algeria; of one-fifth are found on the sea-coast and the Tell, and four-fifths in the Sahara and the semi-arid plateau steppes. Efforts for improvement therefore necessarily be devoted to varieties of sheep adapted to the mentioned districts. Hitherto, the breed most used for improving native sheep has been the Rambouillet, although Crau and Spanish Merinos are also imported. So far, no satisfactory results have been obtained. The official statistics are not suited to the food and climatic conditions obtaining in Algeria. On the Government sheep-farms at Taadmit, Birin, Ben-Chicao and Djebel, the Rambouillet Merinos die very soon after importation. Lambs even do not live. The veterinaries and sheep-breeders are of opinion that the Rambouillet sheep is unsuitable to Algeria. The writer has also little hopes of the greater success of the more resistant breeds such as the Spanish and Crau Merinos. They have shown themselves to have little adaptability, and have only yielded moderately satisfactory results when mated with the native breeds.

According to the writer, the Algerian sheep-breeding industry can only be improved rapidly and economically by means of a rigorous selection of native breeds. Three of the latter are especially adapted to this end: the Libran, Hodna and Ouled-Djellal sheep; they are all hornless, stand in high, and when full-grown give as much as 66 lbs. of mutton. In order to improve the breeds, the writer recommends the careful selection of the best rams, and their distribution by the State to the sheep-breeders.

Fourth Egg-laying Competition in Tasmania. — Profitable Egg-Production in Tasmania. *Agricultural Gazette of Tasmania*, Vol. XXI, No. 5, p. 184. Hobart, May 1913.

The fourth egg-laying competition, held at Springvale, has recently closed, and it is interesting to note some of the chief features in this connection.

In 1909-10 a pen (6 fowls) of White Leghorns scored highest honours, with a total of 1248 eggs. In 1910-11 Black Orpingtons came to the fore with 1318 to their credit. In the two last competitions White Leghorns topped the list with 1250 eggs in 1911-12, and for the season just

finished 1272 eggs. The all-round average of the birds competing improves.

Last year it was pointed out that a perusal of the lists of eggs show that, as compared with previous competitions, there was no "falling aw" in the number of eggs laid in respect to pens at the bottom of the list. In the first competition 28 pens competed, and five of these produced less than 800 eggs each. The second event saw the number of pens increase to 29 and six pens fell below 800 each. Last year the competition had 33 pens and only two of these fell below 800 eggs. This year the three lowest recorded 943, 956 and 983 eggs respectively. This means that the 10 pens in the competition averaged over 157 eggs per bird.

Approaching the results arising from this year's work from another standpoint it will be seen that 19 pens out of the 29, or over 70 per cent recorded more than 1200 eggs per pen, which means that each bird in the pens averaged over 200 eggs. (1). No meat was employed in the diet of the birds competing, but skim-milk and lucerne were provided to furnish protein. The following table shows the first three pen yields and the lowest three for the four competitions at Springvale:

Highest.				
1st year	1248,	1179,	1155;	total: 3582
2nd "	1318,	1298,	1215;	" 3831
3rd "	1250,	1201,	1188;	" 3639
4th "	1272,	1261,	1261;	" 3794
Lowest.				
1st year	670,	654,	410;	total: 1734
2nd "	661,	614,	614;	" 1889
3rd "	801,	794,	634;	" 2227
4th "	983,	956,	943;	" 2882

It is at the tail end where any improvement will be noticeable, as we find that the lowest pen yield in the 4th year more than doubled the number of eggs laid in the corresponding pen entered the first season.

1184 - *Ostrich Farming in Australia*. — HANNAWAY, T. J. in *The Agricultural Gazette of New South Wales*, Vol. XXIV, No. 6, pp. 511-521. Sydney, June 2, 1913.

Several shipments of ostriches have from time to time been imported into Australia. In 1873 the Melbourne Acclimatization Society imported some; and later, in 1881, Mr. W. Malcolm set about establishing ostrich farming in South Australia, and imported a number of birds. A farm was started at Gawler, and a large number of young ostriches were successfully hatched and reared.

About this time an Act was passed by the South Australian Government with a view to encouraging the establishment of the industry, by offering

(1) The grand total of eggs laid by the 29 pens competing was 34137, or an average of 1177 eggs per pen, and as there were six birds per pen the average of each bird was as high as 196 eggs. No substitution of birds was practised in this competition. (Ed.)

ample of 5000 acres of land to the party who first placed 250 ostriches one year old upon the land. Mr. Malcolm's venture was formed into a company (the South Australian Ostrich Company), which obtained 5000 acres near Port Augusta under these conditions.

The country in the neighbourhood of Port Augusta, with an annual average rainfall of only 9 inches, must be classed as inferior pastoral land. The birds have thriven, and a flock of 700 is now pasturing on the land without any artificial feeding except during the first few months of their life when they are fed on lucerne and bran. One and a half acres of lucerne are grown and watered from the town water supply. The farm is greatly handicapped by not being able to produce more green fodder; otherwise a greater number of chicks could be reared. The improvement in the plumage brought about by feeding lucerne was strikingly shown when eight birds were sent to Melrose, about 40 miles distant, where they were grazed in a lucerne paddock. The feathers were clipped and sold to a Melbourne manufacturer, realizing £7 per clip per head, or more than twice the amount realized from the same birds when grazed on the scantily-grassed paddocks at Port Augusta. Birds from the Port Augusta farm have been the origin of almost all the ostriches now pasturing on the various farms throughout the Commonwealth.

In South Australia itself there exists another flock of 400 birds, running on a station near Lake Alexandrina, the nucleus of which came from Port Augusta.

In New South Wales there is a flock of 100 head at South Head, near Sydney, which thrives well, but whose further expansion is limited by lack of space. At Hawkesbury Agricultural College a second flock has been started from a single pair acquired in 1900, and produces feathers of high quality.

Another flock was started at Nardoo, near Coonamble, in 1905, with 250 birds from the South Australian Ostrich Company; the birds now number 550 and it is proposed to increase them still further; 2500 acres are set aside to their use, and the owner of the flock, who also has a 5000-acre sheep run, intimates that he receives greater net profits from the ostriches than from the sheep, though no birds have yet been sold. An artesian well provides abundance of water, and 30 to 40 acres are under lucerne, being cut about every six weeks in summer; this is grown more as a measure of precaution against possible drought than from absolute necessity, so far as present experience goes, hand feeding is rarely required. The lucerne is stored and when fed is chaffed, damped, and mixed with bran or hay. It is estimated that the land will carry 1 bird (or 3 sheep) to every acre, running on natural pasture alone. It will probably prove more profitable to grow fodder, as this would not only increase the carrying capacity of the land, but also raise the quality of the feathers.

The writer has an ostrich farm on the Yanco Irrigation Area; its area is 1000 acres, of which 108 are irrigable and destined to lucerne. The flock is built up from birds from the South Australia Co., and at present num-

bers 90 birds; last year 12 Soudanese ostriches were imported from Africa to be mated with the South Australian strain.

A flock of 24 adult birds, the progeny of the Hawkesbury College str has also been taken to Queensland, where attention is now being paid to subject of ostrich raising.

1185 - **Further Report on the Isle of Wight Bee Disease.** — *Supplement* 3, to the *Journal of the Board of Agriculture*. London, July 1913.

This supplement contains a detailed account of the progress of the investigation into the cause of the Isle of Wight Bee Disease. The latter attended by certain symptoms, such as inability to fly, the presence of merous bees on the ground in front of the hives, and the dwindling of the many other symptoms have however been recorded, and no one of these characteristic of the disease. The only essential feature is the death large numbers of bees, and often of the whole stock, especially during wet and cold periods of the year, or during the winter months. The disease is probably endemic, but owing to lack of information, it probably of passes unnoticed in mild seasons, the loss of bees being attributed to starvation, spring dwindling, etc.

During the years 1911 and 1912, *Nosema apis* in some stage has been found in almost every stock apparently suffering from the Isle of Wight disease which has been examined, and, moreover, no bacteria other than those found in normal bees have been detected. It can therefore be stated with confidence that *Nosema apis* is the agent responsible for most of the outbreaks in which the symptoms of the Isle of Wight disease have been noticed, or in which the stocks have dwindled or died without apparent cause.

1186 - **Domesticated Reindeer in Newfoundland.** — *The Field*, Vol. CXXI, No. (Supplement). London, June 28, 1913.

Dr. Grenfell, the famous Labrador missionary, has been using reindeer teams for hauling his *kometiks* (sleds) in the various trips he has made to his headquarters at St. Anthony along the coast of northern Newfoundland during the past winter. He speaks most enthusiastically of the reindeer experiment, which has appealed so strongly to the Canadian authorities that the Dominion Department of the Interior purchased 40 of these animals last summer for its own use. They were transported from Newfoundland to Edmonton and thence to the Mackenzie delta to be used by the mounted police for drawing teams in winter, so as to prevent a repetition of the tragedy which attended the effort of Inspector Fitzgerald's party to cross the frozen wastes during the winter of 1910-1911.

In the northern part of Newfoundland there are very few horses and dogs for haulage purposes. The same is true of Labrador, where the conditions are even worse, as the Labrador dogs are vicious brutes which attack and devour even human beings. Dr. Grenfell took up the reindeer experiment with the idea of inducing the people to substitute reindeer for dogs soon as he could supply them with sufficient of the former. Reindeer are also useful in providing milk, which is much needed for the children;

propagate very rapidly, it is believed that it will be possible in a few years to kill them for food purposes, and thus help to supply the domestic

The original herd, consisting of 300 Lapland reindeer, was imported by Dr. Grenfell about five years ago, with a fund of \$ 15 000 raised partly in Canada, and partly in England, with \$ 5 000 contributed by the Canadian Government. This herd has increased naturally and now numbers over 1 200. One reindeer will do more work than six of the dogs formerly used. Dr. Grenfell adopted the idea of introducing reindeer into Labrador in 1896. The late Dr. Sheldon Jackson, who introduced them into Alaska twenty years ago. The latter, in spite of many difficulties, succeeded in obtaining a number of these animals, which by successive additions and natural increase now amount in number to 15 000. The world received a lesson in 1896 when a number of whaling ships were frozen fast in the Arctic circle and a herd of 500 reindeer were driven 700 miles to supply them with food.

Reindeer can be used as saddle and as pack animals; they can take 150 lbs. on their backs. Harnessed to a sled, two of them will pull 500 lbs. thirty miles daily. Kellman drove his reindeer express on one day 95 miles in one day. At present the most northerly mail route in the world, that between Kotzebue and Barrow, Alaska, a distance of 650 miles, is served by reindeer. No food need be carried for them, as at the end of each day's journey they are unharnessed and at once dig through the snow with their powerful hoofs to the white moss below, which serves as food.

When Dr. Grenfell began his experiments in Newfoundland, he was not strong enough to secure the services of Capt. W. C. Lindsay, a retired Army officer. The latter took over the control of the herd of reindeer and under his skilful and capable management even better results have been achieved than by the American Government in Alaska. The percentage of living fawns from the Alaskan deer, as given in the Government records, is 40 per cent., whereas at St. Anthony it is nearly 100 per cent. The only trouble that is found at St. Anthony is that the dogs sometimes attack the deer, and the latter in running away over the rough ground break their legs and have to be killed.

An endeavour was made in the summer of last year to secure a number of wild caribou to cross with the reindeer, but owing to the plague of which was unusually bad, the idea had to be given up. It is hoped that there will be greater success this year.

Reindeer wandered considerably more last winter than the previous year; this was due, in the opinion of the Laplanders, to the fact that the natives have learnt that there are no wolves in the country to fear. At the end of another season, it is proposed to break up the present large herd, and distribute it among the Mission Stations in Labrador, where, after the first season of reproduction has continued for some time longer, the Alaskan method of lending small herds to the natives to enable them to replace the lost ones will probably be adopted.

FARM ENGINEERING.

1187 - Motor Plough Competition at Königsberg. — MARTINY in *Maschinen Rundschau*, No. 2, pp. 6-9. Königsberg, July 1913.

The Chamber of Agriculture for the province of East Prussia at Königsberg organized a motor plough trial in a field at Löwenhagen on June 4, 1913.

The following motor-ploughs were presented :

The "Ihace" : 45 to 60 H. P.; it weighs, with ploughing tackle, 16 cwt., and costs £ 1127.

The "Podeus" : 65 H. P., weighs, with five-share balance plough, 7 cwt., and costs £ 1078.

The "Pöhl" 70 H. P.; it weighs, with plough, 5 tons, costs £ 833.

The "Arator" : 50 H. P.; weighs, with plough, about 5 tons, and costs £ 882.

The "Ergomobil" : 30 to 35 H. P. ; weighs, with plough, 9 tons, and costs £ 1054.

The "Stock" : this costs without reversing gear £ 833 ; with it

The "Wede" : 56 H. P.; weighs 5 tons and costs £ 933.

The "Kornnick" : costs about £ 980, and weighs about 4 tons.

Both the soil and the weather were favourable to the trials. The shallow ploughing a two-year-old pastured clover ley on mild loam chosen. For the deeper work, a field dry on the surface and sufficiently moist underneath was used.

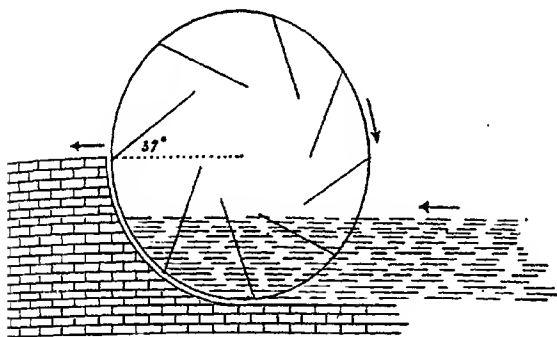
The motor ploughs, thanks to the very favourable soil conditions, worked well. As for the amount of work done, only a few trial tests were made with some of the machines. The results are given in the following table:

Motor plough	Quality of soil	Depth of work	Breadth of work	Speed per second	in per hr.
		inches	ft. in.	feet	
Ihace	Medium soil	9 $\frac{1}{2}$	7 9	2.85	
Arator	"	—	6 7	3.94	
Stock	"	8	6 7	4.26	
Wede	"	8	5 "	3.11	
"	"	9 $\frac{1}{2}$	5 "	2.98	
"	Heavy clay soil in good condition of moisture.	9 $\frac{3}{4}$	5 "	3.60	

Lastly the writer discusses the quality of the work performed by motor plough.

An Egyptian Water-lift. — PARR, A. E. in *The Agricultural Journal of India*, VIII, Part III, pp. 293-294. Calcutta, July 1913.

A very useful water-lift for low-lift canal irrigation has recently received from Egypt. It consists of two circular pieces of iron on about 15 inches apart. These two wheels are connected together

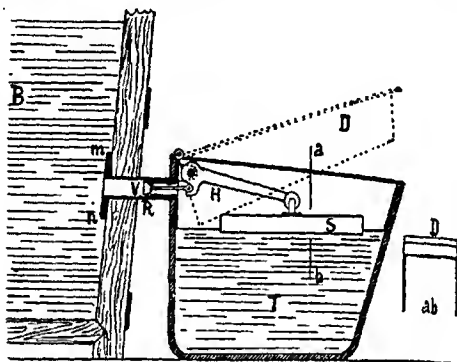


number of vanes set on at an angle of about 37° to the radius, as in the accompanying drawing. The whole thing revolves in a close-fitting masonry basin. It is geared to run at a slow speed and may be worked by one man. The wheel discharges the water at the height of its own axis." The author recommends it as the best machine he has tried for low lift irrigation.

Automatic Drinking Trough (1) for Pigs. — THALLMAYER, V. in *Wiener Landwirthschaftliche Zeitung*, Year 63, No 56, p. 647. Vienna, July 12, 1913.

Automatic drinking troughs for pigs are frequently used, especially in Germany. A simple form of such a trough is the one shown in the accompanying drawing. The trough (T) is provided with a cover (D) under which a float valve is located. The lever (H) connects the float with the valve (V). When the trough is used the float sinks and by means of the lever pushes the valve open, so that the water from the tank or water-pipe (B) can flow into the trough, through the pipe (R); (mn) is a flange.

To the right is a section through the cover along the line (ab), cover (D) is necessary to prevent the animals touching, the first attached parts with their snouts.



Automatic drinking trough for pigs. Vertical section.

1190 - A New Apparatus and Method for Milk Sterilization. - *Losser, Molkerei-Zeitung*, Year 27, No. 57, pp. 1105-1106, Hildesheim, July 25, 1913.

As an appendix to an article which has been already mentioned the writer gives a detailed description and diagrams of a complete plant carrying out the new "Biorisator-Process".

The principal part of the "Biorisator" apparatus is the so-called "Biorisator" sterilizer. This consists in the main of two cylindrical receptacles placed one within the other. In the inner the milk is reduced to a fine spray. In the space between the two cylinders, the milk is heated. Steam is conducted along a pipe at the side, in order to obtain the necessary heat for the inner cavity, and for the sterilization process. As second apparatus may be mentioned a forcing pump, a compressor and a cooler.

The method of working is as follows (see Plate): The milk in the forcing pump (a) is drawn through the pipe (i) by means of the forcing pump and conveyed by (h) to the compressor (c). The manometer (m) regulates the amount of pressure, and the regulator (d) carries back by the pipe (g) any superfluous milk. The milk is conveyed by the pipe (o) from the compressor to the biorisator and issues through fine orifices into the inner of the latter. After having been reduced to spray, the milk flows from the biorisator (e) through the pipes (r) to the cooler (f) and is here cooled as

pipe (w) and flows to the tank (g). From here it runs to the bottling machine (h), where it is immediately put into bottles.

Before the milk is sterilized, the whole plant is cleaned, either by pump-water through it, or preferably by allowing the water to flow through supply pipe (g) into the biorisator, after closing the milk valve (II) and closing the water valve (III). The necessary heat is obtained by opening steam valve (I) at the same time. The very hot water flows through the plant and sterilizes it. After about 10 minutes, the cooler (f) is opened and the water-valve (III) is opened; all the water is drawn off, the temperature is raised to about 75° C. (167° F.) (the heat required for sterilizing the milk), the pump is set going and the milk valve (II) is opened. The apparatus can now work for hours without stopping and only needs occasional attention.

The product obtained by the Biorisator Process is a pure milk, free from bacteria, with the characteristics of raw milk; it is especially suitable for infants. It is also possible to obtain excellent dairy products from milk, which can be treated just like raw milk.

It was also observed in the dairy that there was no evaporation from milk, and consequently no decrease in its amount.

RURAL ECONOMICS.

- **Systems of Land Tenure Prevalent in the Plain Belt of the Province of Treviso, Italy.** — SACCHI, G. in *L'Agricoltura italiana*, Year 39, Part 749. Pisa, August 31, 1912.

This is a short study of the commonest forms of land tenure in the plain of the Province of Treviso, Italy, which shows how in the same regions there are farms worked by the owners, farms leased and farms held on the share system (*metairie*). The least frequent form is farming by the owner himself, because, though the estates are prevalingly large or medium sized, the economic unit is the individual farm, varying in extent from 5 to 15 acres. Farms that are managed directly by their owners or their agents are thus the large estates, and chiefly portions of these that are not divided into farms, or the small holdings of peasant proprietors. The latter are not numerous, but they tend to increase.

The rent is paid partly in cash and partly in kind: that of the arable land of the farm is given in cash or in kind corresponding to a certain sum, while the rent of the vineyards and mulberry plantations is by half of the produce in kind. Frequently a certain number of days of labour or royalties in kind are included in the rent. This form of lease prevails on the right of the *Piave*. The lease is tacitly renewed for a year until either of the parties gives notice to the other between the 1st and the 11th of November. Only the farms belonging to charitable institutions are leased, mostly for periods of nine years, for cash only. The share system, or the half-share system, though not always so simple as in

Tuscany, prevails on the left of the Piave, where the natural fertility of the soil and the just proportion between the available hands and the extent of the farms have been powerful coefficients in the success of this system of tenure, which has led to an advantageous ratio of arable land to plantations of vines, mulberries, etc.

The owner of the land supplies the necessary capital in live stock; he pays one half of the various expenses of production (save labour), the whole of the taxes, and all the cost of new plantations of trees and vines. The expenses caused by the control of fungus pests, as well as the cost of props and wire for the vines, are defrayed in equal shares by the owner and the farmer. The latter, on his side, generally brings into the farm the commonest machines and implements, he provides all the labour and pays house rent, besides giving the owner some royalty in kind and occasionally some days' work and doing some carting for him, especially when the latter manages by himself some small portion of the estate.

The rotation and manuring to be used are determined by the owner. The contract is indefinite and it may come to an end any November provided the necessary notice has been given in the previous March.

1192 - Persons engaged in Agriculture in Prussia according to the Census of June 12, 1907. — HAGMANN in *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Year XXVIII, Part 34, pp. 483-486. Berlin, August 25, 1913.

For the first time, in 1907, the numbers of persons engaged in agriculture have been registered in the returns of professions and occupations. The comprehensive results of this census are given in Vol. 212, 2b of the *Statistics of the German Empire*, which has recently appeared. Table I gives the numbers of persons engaged in agriculture divided into five classes according to the sizes of the farms.

TABLE I. — Persons engaged in agriculture.

Classes according to size	Men	Women	Total	On 100 sq. productive area
Under 5 acres.	747 559	1 846 911	2 594 470	105.0
Between 5 and 12 $\frac{1}{2}$ acres	673 416	824 383	1 497 799	35.5
" 12 $\frac{1}{2}$ " 50 "	1 273 995	1 244 343	2 518 338	17.5
" 50 " 250 "	754 476	620 171	1 374 647	8.5
Over 250	602 992	432 278	1 035 270	7.0
For the total area	4 052 438	4 968 086	9 020 524	17.4

Classes of farms according to size	Managers of farms	Members of family engaged			Foremen and accountants	Temporarily engaged		Temporarily engaged	
		1	2	3		4	5		6
Under 5 acres.	490 762	540 046	1 265 844	1 818	38 802	20 514	236 634		
Between 5 and 12 1/2 acres	379 077	543 480	343 162	1 423	47 864	18 244	164 549		
" 12 1/2 and 50 "	541 840	937 164	336 851	3 785	274 873	52 162	371 663		
" 50 and 250 "	172 940	278 799	83 272	8 474	405 293	135 537	290 332		
Over 250 "	19 363	7 639	3 342	40 627	181 103	459 003	324 193		
Totals	1 603 982	2 307 128	2 032 471	56 177	947 935	685 460	2 387 371		

a) Absolute figures:

b) Out of every 100 persons engaged in agriculture the distribution according to size of farm was:

Classes of farms according to size	Managers of farms	Members of family engaged				Foremen and accountants	Temporarily engaged			Temporarily engaged
		1	2	3	4		5	6	7	
Under 5 acres.	18.9	20.8	48.8	69.6	0.1	1.5	0.8	9.1	11.5	4.5
Between 5 and 12 1/2 acres	25.3	36.3	22.9	59.2	0.1	3.2	1.2	11.0	15.5	11.5
" 12 1/2 and 50 "	21.5	37.2	13.4	50.6	0.1	10.9	2.1	14.8	27.9	15.5
" 50 and 250 "	12.6	20.3	6.0	26.3	0.6	29.5	9.9	21.1	61.1	61.1
Over 250 "	1.9	0.7	0.3	1.0	4.0	17.5	44.3	31.3	97.1	97.1
On all the farms	17.8	25.6	22.5	48.1	0.6	10.5	7.6	15.4	34.1	34.1

In this table are included the persons engaged in forest work on agricultural areas, but the results are but insignificantly affected by inclusion.

The preponderance of women in the two classes of smallest are due to the fact that in the small farms the work is for the most part done by the holders themselves with the members of their families, especially women folk (wives, and daughters).

As for the *intensity of the work*, an idea can be gained when the number of persons engaged per area of 100 acres is considered. It appears that the number of persons engaged diminishes with the increase of the area of holding. In these figures, however, the real numbers of workers do not agree with exactitude, because in the smaller and middle sized farms there are persons returned as present whose work is only partially or not at all devoted to farming. The real numbers of workers in the classes of the smaller holdings are in reality smaller than those returned.

According to the position held in the farms, the statistics distinguish between : *managers, members of the family and labourers.*

The numbers of persons in Prussia on June 11, 1907, belonging to the three groups are shown in Table II.

From the above figures it appears that in the whole State the persons employed in agriculture are to the extent of about two-thirds members of the holders' family and one-third hired labourers. The ratio between members of the holders' family and the strangers varies of course considerably according to the size of the farm. In the smaller-sized holdings holders and the members of their families prevail, namely for the small holdings they are 88.5 per cent., for small farms 84.5 per cent., for medium sized farms 72.1 per cent. and for large estates a very low percentage. The reverse is the case with hired labour. In the smallest farms it is employed very sparingly, in medium-sized farms it is 27.9 per cent. of the total, and in large estates it attains to 97.1 per cent.

Table II shows the character of the agricultural working population. The members of the holders' families are divided into two main groups: those who are permanently employed on the farms and those only temporarily engaged; more than half of the members of families belong to the first group. Their number increases generally with the size of the farm, while the temporarily engaged members are found in the greatest numbers in the smallest holdings. In these, during ordinary periods but a small amount of labour is required, and during the short periods in which there is a great deal of work to be done the members of the holders' families assist. Hired labour is divided into overseers and accountants, permanently (farm servants, maids, and day labourers) and temporarily engaged hands. To the last belong especially non-resident hands.

The first group is an exceedingly small one. The greatest part is for the holders themselves, among whom there are more farm servants and maids than day labourers. In each of the classes according to the size of the farm the distribution of these labourers varies greatly. The proportion of farm servants and maids increases with the size of the farm, but diminishes

tain in the largest farms, in which the greatest contingent is that of day labourers.

This distribution of agricultural labour is of the greatest importance for the study of the labour question. The large estates are especially affected by the want of permanent hands. A sufficient number of farm servants and maids is a vital necessity for large estates, for without them the regular work of the farm cannot be carried on. This is seen also from the distribution of permanent and temporary hired labourers. The latter are relatively more numerous in the smaller holdings and diminish with the increase in the size of the farm.

The small holdings are in a position to attract outside labourers during the busiest periods of the year, when the assistance of the members of the family is insufficient or not available. For the larger farms a staff of permanent labourers is absolutely necessary, because they cannot, like the smaller ones, dispense with themselves during the busy time of the temporarily disengaged hands.

The work of children, that is persons under the age of fourteen, is, as may be seen from Table III, an important factor.

TABLE III.

		Numbers of children employed	Numbers of children among 100 persons employed in the corresponding class
Members of the farmer's family	permanently	35 531	1.54
	temporarily	225 732	11.10
Outside la- bour	permanently	32 150	2.32
	temporarily	54 714	3.24

Lastly the following average figures for the kingdom of Prussia are given according to the sizes of the farms.

	Percentage of area
Farms under 12.5 acres	12.9
" between 12.5 and 50 acres	27.7
" " 50 " 250 "	31.3
" over 250 " "	28.1

The following figures show the percentage of productive land occupied by various crops:

	per cent.
Cereals	48.4
Forage crops.	25.8
Potatoes and beets.	12.6

The average number of persons engaged on 100 acres of productive land in Prussia is 17.4.

1193 - **The Farmer's Income in the United States.** — SPILLMAN, W. J. in *U. S. States Department of Agriculture, Bureau of Plant Industry, Circular No. 130*, pp. Washington, July 19, 1913.

The data upon which this article is based are obtained from the census of 1910, combined with certain factors worked out in the experience of Office of Farm Management in conducting farm management surveys.

There are two items of income about which no information is available, viz. the value of the milk and cream consumed on the farm, and what farmer earns for work outside his farm; and one item of expenditure which cannot be determined, viz. the amount paid for live stock. The data presented in the accompanying table should be interpreted in the light of these omissions.

The average area of the American farm in 1910 was 138.1 acres, of which are classed as improved land and 49.77 acres as devoted to crops. The total average investment per farm is \$6 443.67, the amount in farm buildings being \$ 994.33 and that in implements and machinery \$ 198.88.

All the data for the receipts as given in the table were obtained from census returns. The farm is also credited with the total value of all crops produced except that part fed to live stock, which is obtained by deducting the value of forage sold from the total value of the forage crop. The farm is thus credited with the butter, cheese, eggs, poultry, honey, meat, fruits, vegetables, bread, etc., consumed on the farm where it is produced, and the value thus consumed on the farm is included in the farm income.

Any revenue from outside sources should be added to the net income given in Table I.

The expenses for labour, fertilisers and fodder are obtained from census returns also. The cost of maintenance of farm buildings is placed at 5 per cent. of their value, and that of implements and machinery (including repairs) at 20 per cent. of their cash value, both figures being based on extensive investigations by the Office of Farm Management, and agree with the estimates in Warren's "Farm Management". Taxes are assumed to be 0.6 per cent. as an average for the whole country.

The remaining items of expense in the conduct of a farm are collectively calculated as 15 per cent. of other expenditure, which is the average obtained from a number of farm management surveys conducted by the Office of Farm Management. The total farm expenses, omitting the cost of live stock purchased, amount to \$340.15.

The farm income is obtained by deducting the total expenses from the total receipts, and amounts to \$640.40. Assuming 5 per cent. as the rate of interest to which the farm investment (of \$ 6 443.67) is entitled, the farm income is then distributed between interest and labour income as follows: Interest on investment, \$ 322.18; labour income \$ 318.22.

The average farm mortgage based on the number of all farms, is \$1 412.50, which at 6 per cent. per annum amounts to \$102.90. Deducting this amount from the farm income of \$ 640.40 we get \$537.50 (to which must

TABLE. — *Labour income of farmers in the United States.*

Item	Total	Amount per farm
Number of farms	6 361 502	—
Improved land acres.	478 451 750	75.2
Capital farm investment	\$ 40 991 449 090	\$ 6 443.67
Investment in farm buildings	\$ 6 325 451 528	\$ 994.33
Investment in implements and machinery	\$ 1 265 149 783	\$ 198.88
<i>Receipts.</i>		
Farm products (excluding milk and cream used at home)	596 413 463	\$ 93.75
Wool	65 474 328	10.29
Hides	901 597	0.14
Products produced	306 688 960	48.21
Woolly raised	202 506 272	31.83
Wool and wax	5 992 083	0.94
Domestic animals sold	1 562 936 694	245.69
Domestic animals slaughtered	270 238 793	42.48
Value of all crops \$ 5 487 161 223		
. 1 438 583 919		
. 414 697 422		
. 92 458 571		
etc. 824 004 877		
Value of crops		
for feeding 2 769 714 789		
sold 509 253 522		
Value of crops fed 2 260 461 267		
Value of crops	3 226 699 956	507.22
Total gross farm income.	6 237 850 146	980.55
<i>Expenses.</i>		
Interest	\$ 651 611 287	\$ 102.43
Depreciation	114 882 541	18.06
Maintenance of buildings (at 5 %)	299 839 857	47.13
Maintenance of implements and machinery (20 %)	316 272 576	49.72
(0.6 %)	253 029 956	39.78
. 245 947 694		38.66
Total	1 881 584 911	295.78
Incidental expenses (15 % of other expenses)	282 237 736	44.37
Total expenses	2 163 822 647	340.15
<i>Summary.</i>		
Gross income	\$ 6 237 850 146	\$ 980.55
Expenses	2 163 822 647	340.15
Net farm income	4 074 027 499	640.40
Investment on investment (at 5 %)	2 049 572 454	322.18
Labour income	2 024 455 045	318.22
Investment on mortgage (\$ 1 715 at 6 %)		102.90
Available for purchase of live stock and for family living		537.50

added the value of milk and cream consumed on the farm and any other income) as the sum to be used in the purchase of live stock, in living expenses and in savings.

As the majority of farmers are capitalists, the interest on capital constitutes part of the income and the labour income is undoubtedly smaller than it would be if the farmer did not also have the interest on his capital. We find that in the better agricultural sections, the labour income of tenants is considerably higher than that of farmers who work their own land, although the latter may have larger total incomes than the tenants. In fact a large number of American farmers live on the interest of their investment and do not receive anything for their own wages. But this is possible on the small farm, where the interest is too small to admit of a high standard of living, and the farmer must have some labour income in addition.

In America it is reasonable to infer that at least half the farm families of the country have incomes smaller than those given in Table I. Individual farmers here and there have larger incomes than this average, but the facts presented in the table indicate that on the whole the income of farmers in this country, even when we include as a part of the income those tobacco consumed on the farm where they are produced, is certainly not more sufficient to pay 5 per cent. on the investment and ordinary farm wages than the labour they do, and it is probably considerably less than this.

1194 - Notes on Tobacco-Growing in Germany. — LANG, H. Einiges aus den 60 Jahren der deutschen Tabakstatistik. — *Fühlings Landwirtschaftliche Zeitung*, Year 62, Part 1, pp. 409-426. Stuttgart, June 13, 1913.

The number of German tobacco-growers has much decreased during the last 20 years, for while in the five years 1891-1895 there were 151,390 persons growing this crop in the district under the jurisdiction of the German Customs, the figures for the subsequent periods of five years were as follows:

1896-1900 : 136,352
1901-1905 : 108,606
1906-1910 : 95,369

The tobacco growers have thus progressively decreased in the proportion 100 : 90.1 : 71.7 : 62.9. The following table gives the details of the decrease in the principal tobacco-producing districts of Germany:

Years	Prussia				Baden				Bavaria	Alsace-Lorraine
	Number of planters	In % of the total number of the Empire	In % of the numbers of the first 5 years' period	Number of planters	In % of the total number of the Empire	In % of the numbers of the first 5 years' period	Number of planters	In % of the numbers of the first 5 years' period	Number of planters	In % of the numbers of the first 5 years' period
1891-1895 . . .	82,962	54.8	100	37,469	24.8	100	100	100	100	100
1896-1900 . . .	68,444	50.2	82.5	39,125	28.7	104.4	91.4	89.2	89.2	89.2
1901-1905 . . .	49,445	45.5	59.6	34,694	31.9	92.6	83.0	71.7	71.7	71.7
1906-1910 . . .	37,582	39.5	45.3	34,316	36.0	91.6	79.9	64.9	64.9	64.9

the area cultivated by each tobacco-grower has, however, considerably decreased, and consequently the total area under tobacco has decreased in proportion very different from that in which the number of cultivators has decreased. The cultivated area was as follows:

1891-1895	43 021 acres
1896-1900	44 748 "
1901-1905	39 908 "
1906-1910	37 647 "

The decrease occurred in the following proportion 100 : 104.0 : 92.7 : 83.8. The increase or decrease of the area under tobacco in the various States is shown by the following table.

TABLE II.

Years	In % of the total under tobacco in the Empire		In % of the area under tobacco in the different districts during the first five years.					
	Prussia	Baden	Prussia	Baden	Bavaria	Alsace-Lorraine	Wurttemberg	Hesse
1895 . . .	29.2	39.9	100	100	100	100	100	100
1900 . . .	29.8	41.2	106.3	107.5	94.8	102.0	105.5	95.7
1905 . . .	29.1	41.0	92.6	95.4	88.8	96.4	80.5	83.4
1910 . . .	25.8	43.3	77.3	95.0	85.5	101.7	85.8	83.8

In consequence of the decrease in the area under tobacco, and owing to the fact that the yield per acre has rather diminished than increased, the total production of tobacco, after a temporary rise in the second five-year period, fell considerably in the two succeeding five-year periods, as is shown by the following figures:

	Amount of tobacco gathered (dry)	
	Absolute amount	Relative amount in % of the first five-year period
1891-1895	722 767	100
1896-1900	742 320	102.9
1901-1905	695 382	96.2
1906-1910	599 049	82.9

The proportions for the various States are given in Table III.

TABLE III.

	Prussia	Baden	Bavaria	Alsace-Lor.
1891-1895	100	100	100	100
1896-1900	96.8	109.0	98.1	104.1
1901-1905	90.2	100.8	95.5	100.
1906-1910	74.0	86.7	83.8	97.

While the production decreases, the price of tobacco rises, and as latter movement is relatively stronger than the former, the result is an increase in the total value of the crops.

TABLE IV.

	Total value of annual tobacco crop in Germany £	General movement	Increase and decrease in the various States				
			Prussia	Baden	Bavaria	Alsace- Lorraine	Wurttem- burg
1891-1895	1 434 097	100	100	100	100	100	100
1896-1900	1 484 798	103.5	94.4	112.2	101.8	103.0	99.5
1901-1905	1 436 863	100.1	90.7	105.0	103.2	109.7	90.1
1906-1910	1 536 658	107.1	92.2	112.8	114.2	129.3	109.3

The average crop per surface unit has, on the whole, remained the same; it was as follows per acre throughout the Empire:

1901-1905	16.81 cwt.
1906-1900	16.61 "
1901-1905	17.44 "
1906-1910	15.93 "

Great variations have been found in the yield per acre in different tracts. If the average crop in each period of five years is taken at 10 yield per acre is as given in Table V.

TABLE V.

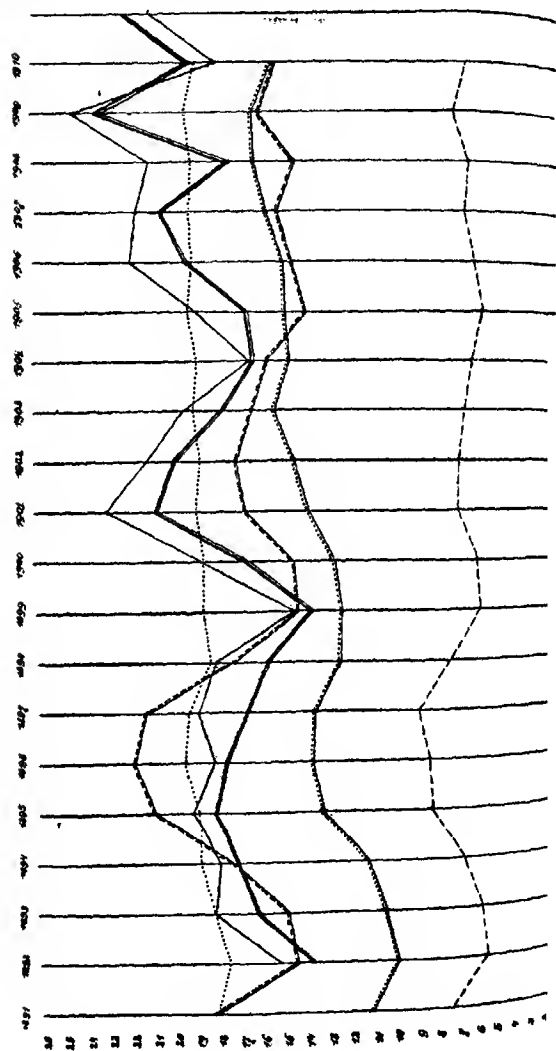
	Prussia	Baden	Bavaria	Wurtemberg	Alsace-Lorraine	Hesse
1895 . . .	96.9	102.3	as a rule from 6 to 10 % below the average for the Empire	102.3	124.4	80.2
1900 . . .	90.3	105.6		104.9	128.7	79.5
1905 . . .	91.1	104.6		107.1	126.8	84.4
1910 . . .	98.6	99.5		109.4	127.2	77.0

The average price of tobacco has risen throughout the Empire during four five-year periods to 39s 8d, 40s, 41s 3d, and 51s 3d respectively. It thus increased proportionately from 100 to 100.9, 104.1 and 129.1. The money return per acre has also notably increased. It rose from £33 7s in the first five-year period, and £33 3s 9d in the second, to £36 os 6d and 16s 6d in the two last periods. The proportion is thus 100:99.5:122.3. Nevertheless, the different States have taken very unequal parts in this development, as is shown by Table VI.

TABLE VI. — *Value of the crop per surface unit in % of the value of first five-year period.*

	Prussia	Baden	Bavaria	Wurtemberg	Alsace-Lorraine	Hesse
1-1895	100	100	100	100	100	100
6-1900	88.7	104.2	107.3	94.3	101.0	100.3
11-1905	97.8	110.0	116.5	111.9	113.6	123.0
6-1910	119.1	118.7	133.7	127.1	127.0	133.1

The value of the tobacco produced per surface unit varies much from year to another; these fluctuations not only cause uncertainty and anxiety to the growers, but have a considerable influence upon the general activity of the planters. After some good seasons, the area under tobacco once increases, not only because new cultivators add fresh plantations to those already existing, but also from an extension of the former tobacco fields. On the other hand, after some bad seasons, not only do many planters abandon the undertaking, but those who remain faithful to the industry reduce the area under cultivation. The writer gives a graphic representa-



of this movement in the German Empire and the Grand Duchy of Baden (The double lines refer to the former, and the single lines to the latter). The graphic curve gives the amount realized each year by the tobacco yield per hectare (2.47 acres): the figures at the extreme left each represent marks (about £5). The two curves referring to the Empire and the Grand Duchy of Baden (continuous lines) are displaced by a column—that is, by a year—towards the right. This is done in order to show more clearly that the crop obtained one year has an undoubted effect upon the yield placed under tobacco the next year, and that this occurs with the utmost regularity. As for the area under tobacco in any given year (broken lines), the figures on the extreme left each represent 1000 ha. (2470 acres), and in the case of the figures relating to the area cultivated by each planter (red lines), every figure represents one are (4 rods).

AGRICULTURAL INDUSTRIES.

A Practical Formula for the Calculation of the Solids not Fat in Milk. —

JÖNBERG, M. H. in *Zeitschrift für Fleisch- und Milch-hygiene*, Year 23, Part 23, pp. 339-341. Berlin, September 1, 1913.

The formula given by the writer is based upon the same principle as that of Bertschinger, viz:

$$\text{Solids not fat} = \frac{\text{degree of lactodensimeter} + \text{percentage of fat}}{4}$$

If, for instance, the specific gravity of the milk is 1.034 and the fat content 2.8 per cent, the solids not fat = $\frac{34.0 + 2.8}{4} = 9.2$.

This formula has the advantages of being simple and accurate, and of giving quick results.

Also, as is seen by the experimental data reproduced in Tables I, II, III (1), it is superior to Ackermann's automatic calculator, and especially adapted for testing doubtful milk.

(1) The Tables 1 and 2 are reproduced in a slightly abridged form.

TABLE I. — *Results obtained from samples of doubtful milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according Ackermann automatic calculator
1	1.0270	2.38	7.34	7.34	7.47
3	1.0300	2.70	8.07	8.17	8.30
4	1.0257	3.00	7.11	7.17	7.27
6	1.0312	2.24	8.43	8.36	8.49
8	1.0326	2.02	8.68	8.65	8.81
9	1.0293	3.08	8.05	8.09	8.20
11	1.0257	2.71	7.25	7.10	7.21
12	1.0275	2.79	7.41	7.57	7.68
14	1.0295	2.21	8.02	7.92	8.06
16	1.0268	2.66	7.17	7.36	7.48
17	1.0308	2.26	8.41	8.26	8.39
19	1.0287	2.38	7.34	7.77	7.90
20	1.0292	2.64	7.79	7.96	8.08
22	1.0296	2.40	7.83	8.00	8.13
24	1.0292	2.16	7.63	7.84	7.98

TABLE II. — *Results obtained from samples of normal milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat		
			according to chemical analysis	according to the new formula	according to Ackermann automatic calculator
1	1.0330	3.44	9.12	9.11	9.19
3	1.0320	4.14	9.06	9.03	9.07
4	1.0315	4.19	8.96	8.92	8.96
6	1.0330	3.04	9.06	9.01	9.11
7	1.0320	3.23	8.77	8.80	8.91
9	1.0310	3.27	8.47	8.56	8.78
11	1.0315	3.21	8.83	8.67	8.77
12	1.0325	3.38	9.10	8.97	8.79
14	1.0315	3.21	8.83	8.67	8.77
15	1.0320	2.97	8.98	8.74	8.85
16	1.0320	3.14	9.02	8.78	8.90
17	1.0320	3.00	9.02	8.75	8.93
18	1.0320	3.22	8.51	8.60	8.91
20	1.0320	3.51	8.59	8.87	8.95

TABLE III. — *Results obtained with samples of half milk.*

Milk — No.	Specific gravity	Fat — %	Quantity of solids not fat	
			according to chemical analysis	according to the new formula
1	1.0288	0.89	7.45	7.41
2	1.0342	0.91	8.72	8.77
3	1.0340	0.97	8.35	8.74
4	1.0262	0.88	6.66	6.67
5	1.0292	0.94	7.58	7.53
6	1.0349	0.90	8.91	8.95
7	1.0362	1.05	9.11	9.31

- **The Specific Gravity of Cow's Milk and the Change it Undergoes Shortly After Milking.** — FLEISCHMANN and WIEGNER in *Journal für Landwirtschaft*, Vol. 61, part 3, pp. 283-323. Berlin, July 21, 1913.

Quévenne, the inventor of the lactodensimeter, had already observed in the course of the first 4 to 6 hours subsequent to milking, the specific gravity of cow's milk increased on the average 0.0008 to 0.0015, when kept at a temperature below 30°C. Opinions have hitherto been divided as to the causes of this property possessed by milk. Quévenne, and later Reiss and Sommerfeld, thought that this increase in specific gravity occurred through the volatilization, immediately after milking, of gases present in solution in the milk. Bouchardat considered the increase in specific gravity to be due to a molecular change in the structure of sugar of milk. Other investigators attributed the phenomenon to a rise in the volume of the fat globules. Recknagel, Kirchner and Fleischmann considered that the casein globules expanded further. Lately, the alteration in the volume of the fat globules has often been cited as the cause of change in the specific gravity of milk. So far, however, the literature dealing with the subject has furnished no reliable data based on accurate investigations.

The writers have subjected to rigorous examination all the accounts of the experiments hitherto made to elucidate this circumstance, and to the end have themselves carried out exhaustive investigations in the Laboratory of Milk Chemistry at the Göttingen University. The results prove that the hypothesis of gas volatilization does not explain the phenomenon. Alteration in the milk sugar or movement of the globules, such as could cause the specific gravity, was observed. No support was found for the theory of the expansion of the casein globules which was put forward by Recknagel. The writers, however, observed the existence of a certain inter-

relation between increased specific gravity and the presence of fat globules. When, for instance, the milk was kept for 22 hours at the same temperature as at the moment of milking, no increase in specific gravity was noticed. The specific gravity of milk which had been recently milked and then cooled down to 3°C ., increased 0.0015; on the milk being subsequently warmed up to 45°C ., the specific gravity sank to what it was before. Skimmed milk did not increase in specific gravity even after a longer time or after having been cooled to a lower temperature. The larger the fat content, the higher the increase in specific gravity if the milk was kept below the melting point of the butter fat. Kept at body heat, milk with a high or with a low fat content underwent no change in its specific gravity. Solidified butter fat possesses a higher specific gravity than liquid butter fat. The specific gravity of emulsions of fat and water is less than that of milk.

The temperature oscillations of the milk globules were produced with the same rapidity as those of the milk plasma. The writers have come to the conclusion, as a result of their researches, that the increase in specific gravity which occurs in the case of milk which has recently been milked, is due to the coagulation of the fat globules present.

1197 - **Practical Methods for the Determination of Fat in Cheeses. Comparison of the Methods in Use, with Special Regard to the New Processes of Kooper and Wendler.** — HERRMANN, H. in *Molkerei-Zeitung*, Year 27, No. 54, pp. 1054, Hildesheim, July 16, 1913.

The writer speaks of the methods most usually employed for the determination of the fat in cheese, viz. those of Siegfeld and Gerber; he compares them with Kooper and Wendler's methods and gives the results of comparative experiments, comparing the data thus obtained with the results of Bondzinski-Radzlaiff method. He thus shows, that for the analysis of cheese rich in fatty matter, the Siegfeld method and those of Kooper and Wendler are as suitable, and give almost as accurate results, as the Bondzinski-Radzlaiff process. The Kooper method is the one most adapted for the estimation of fatty matter in cheeses which are poor in fat.

1198 - **The Consumption of Meat and Milk in Japan in 1911.** — *The Annual Report of the Central Sanitary Bureau of the Imperial Japanese Government for the 44th Year Meiji (1911)*, pp. III + 73 + 172 + 106. Tokyo, 1913.

The number of slaughter-houses existing at the end of 1911 was 41, of which 219 were public, and 276 private. The number of animals slaughtered is given in Table I:

The average annual consumption of meat per inhabitant in 1911 was 2.74 lbs.

The number of animals prohibited to be slaughtered after examination was 460 bullocks, 46 calves, 54 pigs and 316 horses. The number of animals ordered to be entirely thrown away after slaughtering was 193 bullocks, 6 calves, 47 pigs and 17 horses, while that of those of which only parts were thrown away was 5165 bullocks, 92 calves, 2296 pigs and 1181 horses. Besides these there were some cases where the viscera only were ordered to be thrown away.

TABLE I.

	No. of animals slaughtered	Weight of meat — lbs.	Average weight of meat per animal — lbs.
cows	262 588	97 640 000	374.84
sheep	21 858	2 395 600	109.60
goats and goats	2 488	24 350	25.73
horses	198 423	23 415 500	118.01
others	66 555	16 527 500	248.33

At the end of 1911, there were in Japan 5691 dairy-farms; these produced during the year 10 113 000 gallons of milk, which corresponds to an annual consumption per head of $1 \frac{1}{2}$ pint. Compared with the previous year, there was an increase of 2.6 per cent. in the number of dairies, of 9.8 per cent. in the production of cow's milk. The prefectures of Iwate, Tottori, and Kagoshima produced 7 460 gallons of goat's milk, that is, four times as much as in the preceding year. There were 47 condensed milk factories, which turned out 1 480 000 lbs.

Table II gives the amount of milk and of condensed milk produced in chief dairy prefectures.

Prefecture	Milk — galls	Condensed milk — lb.
Iwate	1 748 000	70 250
Ishikawa	655 000	17 930
Iwano	432 700	2,740
Iwama	241 900	156 250
Iwate	110 900	273 850
Ishikawa	491 100	—
Iwano	331 800	663 800
Iwaguchi	163 550	122 500
Iwado	461 400	131 500

1199 - Annual Wool Review for Australasia. — *Dalgety's Review (Australasian Annual Wool Number 1913, p. 83, Sydney, July 1, 1913.*

The total quantity of wool of Australasia exported has been 2 247 3 bales or 721 821 516 lbs., as against 2 537 867 bales or 840 694 748 lbs. in 1911-12. To arrive at the actual production it is necessary to add the amount of wool used by manufacturers in Australasia, namely, 87 775 bales or 28 175 775 lbs. The result shows the actual production of wool for the past twelve months to have been 2 335 040 bales or 749 997 291 lbs., as against 2 637 127 bales or 873 549 808 lbs. in 1911-12.

The average weight per bale of the past clip as dealt with in Australasian markets is 321.2 lbs., as against 331.2 lbs. for the previous year, 332.1 lbs. for 1910-11, 335.5 lbs. in 1909-10, 330.6 lbs. in 1908-9, 333.7 lbs. in 1907-8, and 339.7 lbs. in 1906-7.

It will be seen that the decreased average weight of the bales during the past wool year has been 10 lbs., whilst compared with six years ago the increase in weight is no less than 19.7 lbs.

Sheep numbers as at the close of the year show the very serious fall off of 9 809 634 head, as compared with the same point twelve months ago and it will take a succession of good seasons to regain the lost ground. Details as to the number for each State compared with those returned at the end of the two preceding years are shown in Table I.

TABLE I.

States	1912	1911	1910
New South Wales	39 436 118	45 032 022	45 825 3
Victoria	11 892 224	13 857 804	12 937 5
Queensland	20 248 580	20 387 838	20 153 1
South Australia	5 481 487	6 267 477	6 432 1
West Australia	4 593 458	5 408 583	5 157 1
Tasmania	1 800 000	1 788 310	1 735 1
Commonwealth	83 451 867	92 742 034	92 241 1
New Zealand	23 750 153	24 269 620	23 792 1
Australasia	107 202 020	117 011 654	116 034 1

The average price per bale realised for the 1 804 801 bales sold in Australasian markets has been £13 13s 1d, which compares with £11 1s 1d.

11-12, £ 12 10s 4d in 1910-11, £13 12s 2d in 1909-10, and £ 12 9s 0d for the past thirteen years.

The value of the clip sold in Australasia during the past year has amounted to £ 24 642 643, whereas during the previous year 1 926 926 bales sold realised £22 682 090, and in 1910-11 the 1 865 167 bales sold realised £16 602. The average number of bales sold in the Australasian markets during the past seven years has been 1 719 066, and the average realisation 86 002 per annum.

The past clip was composed of 69 per cent. merino, and 31 per cent. crossbred, a slight increase in the proportion of crossbred as compared with the previous year, when the respective proportions were 72 and 28 per cent. The clip of 1910-11 was composed of 76 per cent. merino, and 24 per cent. crossbred, while in 1908-9 there was 78 per cent. of merino and 22 per cent. of crossbred.

The comparative failure of the 1912 lambing is revealed by the quantity of lambs' wool sold in Australasia during the past twelve months, which amounted to 65 106 bales, as compared with 93 050 bales for the preceding year, 98 314 bales for 1910-11, 108 808 bales in 1909-10, 69 456 bales in 1908-9, and 70 980 bales in 1907-8. The proportion of lambs' to fleece was 12 per cent., as compared with 5 per cent. for the two preceding years, and 10 per cent., 4 per cent., 5 per cent., and 7 per cent. respectively for the years before that date.

The quantity of scoured wool sold in Australasian markets has been 111 bales, or 8 per cent. of the total wool sold, which compares with 146 bales, or 7 per cent., in 1911-12; 160 326 bales, or 9 per cent., in 1910-11; 195 241 bales, or 10 per cent., in 1909-10; and 177 877 bales, or 8 per cent., in 1908-9.

Experimental Contributions on the Subject of the Disinfection of Hides and Fleeces containing Anthrax Spores. — SEVCIK in *Zeitschrift für Infektionskrankheiten, Parasitäre Krankheiten und Hygiene der Haustiere*, Vol. 13, Part 6, pp. 322-48; Part 7, pp. 429-452. Berlin, June and July 1913.

An account of culture experiments and experiments on animals undertaken for the purpose of testing the methods adopted by Seymour-Jones and Schattenfroh for the disinfection of hides and fleeces containing anthrax spores.

It was shown that a 0.02 per cent. solution of sublimate, as recommended by Seymour-Jones for dried sheep-skins and large hides, is unnecessary, and that ox-hides, even if placed in a solution of sublimate ten times as long and left there for 48 hours, are not necessarily free from infection. Schattenfroh's method was perfectly satisfactory for the sterilization of pig and rabbit skins, but was not efficacious in the case of ox-hides and disease-free sheep-skins. On account of its cheapness and the small amount of danger it entails, this system is to be recommended for the sterilization of small skins.

1201 - Notes on the Vine-Growing Districts of Chile (1). CANO, G. (Director of the Oenological Station of Chile) In *Annales de la Science Agricole*, Vol. No. 5, pp. 351-365. Paris, May 1913.

Vine-growing is one of the most ancient and most important industries of Chile.

Conditions of vine-cultivation. — A large portion of Chile lies between the 30th and 38th degrees of south latitude which delimit the area which is essentially suitable to vine cultivation. This area is bounded on the east by the Andes, while on the west, the temperature is regulated by the presence of the Pacific Ocean. This vast zone enjoys an exceptional climate and is free from hail storms. The rainy season coincides with the winter and the long summer is hot and dry, spring frosts are rare, and cryptogamic diseases infrequent. *Oidium* exists, but though sulphur dustings are carelessly carried out, this fungus does little harm. Mildew is practically non-existent. On the other hand, anthracnose has made its appearance in several departments. Further, *Conchylis ambiguella*, *Halica ampelophaga*, *Eudemis (Polychrosis) botrana* and *Oenophitra pilleriana* are unknown in Chile, though other parasites exist there, such as *Phytoptus vitis*, *Tylenchus* sp., *Tylenchus* sp. and even *Margarodes viticum*. To all the advantages Chile possesses should be added a plentiful supply of water at least in the valleys where most of the vineyards are situated. The streams descending in large numbers from the Andes permit of the systematic irrigation of the vines according to the requirements of the different vineyards.

Methods of vine-growing and wine-making. — These vary according to the several zones. If the old vines of the country, owing to their age, do not receive all the attention they require, the new vines, which are planted in lines and supported by iron wire, are, as a rule, carefully tended as regards the cleanliness of the soil, and are systematically pruned. Further, while the cellars belonging to the old Spanish vineyards are nearly all badly constructed and provided with very primitive appliances, those properties are numerous where the cellars are carefully made and furnished with all the appliances which are requisite for handling the grapes and for subsequent work in the cellar.

The Wine-making Station of Chile has greatly contributed to the improvement of the methods of work, by its critical studies of the different wines, its repeated advice, and by the publication of numerous instructional plans. Further, by means of lectures held on the spot in the different growing regions, and an incessant propaganda, it encourages and promotes industrial methods of wine-making.

Chilian wines — From certain French vines, viz. Cabernet, Pinot, Cot, Verdot, there are produced in the neighbourhood of Santiago, especially in the "Llano de Maipo" and the "Llano Subercaseux", full-bodied wines, of relatively good quality and bouquet, which resemble Bordeaux

(1) See No. 1638, B. Dec. 1912.

ork up fairly quickly, but improve little on keeping. From Pinot-noir gathered before it is over-ripe, and treated with care, relatively light are produced; these are good in quality and have a delicate flavour, hat resembling Burgundies.

aking generally, in the same zone, the white wines are inferior to the émillon, in particular, is nearly always deficient in mellowness. e other hand, some cellars produce from Pinot-blanc a very mellow with a pleasant bouquet. Some experiments should be mentioned were made with wines resembling certain types of Santernais. By t was proved that with a little method and perseverance it is possible ain wines possessing bouquet and preserving a certain amount of . The following table gives the analyses of wines made from differ- es, for the purpose of determining a few of the chemical characteris- these products. The wines analysed were new, as a rule.

TABLE I. — *Wines from the neighbourhood of Santiago.*

Composition	Cabernet	Pinot	Merlot	Verdot	Romano	Sémillon	Sauvignon	Pinot blanc	Folle blanche
.....	995.2	995.4	994.7	994.8	995.6	992.0	992.0	991.4	995.8
percent, in vol.	11.8	12.5	12.2	11.0	12.4	12.1	10.9	12.0	10.4
alcohol, per 1000	24.34	26.12	22.18	17.44	26.66	16.68	12.2	13.04	21.00
g substances in le per 1000 . .	2.17	2.47	2.17	1.92	2.97	1.92	0.78	1.43	1.78
es in Potassium ates, per 1000 .	0.55	0.54	0.39	0.33	0.37	0.40	0.32	0.37	0.59
#tartar per 1000	3.06	2.46	3.13	3.57	3.81	2.53	3.13	1.78	3.96
lmatters p. 1000	2.42	2.56	2.82	1.96	1.44	1.50	1.36	1.48	2.04
idity in H ₂ SO ₄ oo.	2.94	4.13	3.80	4.04	4.86	4.74	4.09	3.76	5.45
: acidity, in O ₂ per 1000 . .	0.31	0.49	0.30	0.39	0.40	0.34	0.74	0.82	0.67

another important vine-growing zone is that of "Lontué" and "ca." The crops are often larger than those in the neighbourhood of ago, especially in the first of the above localities. The wines are less sicc and poorer in dry extract; they are also inferior in quality. Table attains some types of analyses of the wines of this district.

TABLE II. — *Lontué Wines.*

	Cabernet	Pinot	Cot	Merlot	Sémillon
Density ^{70°}	944.5	993.4	994.3	995.4	993.0
Alcohol per cent. in vol. . . .	11.8	11.9	11.2	11.2	12.7
Extract at 100°, per 1000 . . .	21.12	16.78	20.34	22.90	19.40
Reducing substances, in glucose per 1000	1.66	1.85	1.47	0.78	2.25
Sulphates, in potassium sulphate per 1000	0.35	0.34	0.30	0.49	0.33
Cream of tartar per 1000 . . .	3.65	2.61	3.21	3.43	2.53
Mineral substances per 1000 . .	2.30	2.04	2.42	2.70	1.24
Total acidity, in H_2SO_4 per 1000	3.92	3.19	3.35	4.53	4.11
Volatile acidity, in $C_2H_4O_2$ per 1000	0.41	0.32	0.35	0.79	0.30

TABLE III. — *Wines of the Coast Cordilleras.*

	Red wines of the country			Sémillon	White wines of the	
	Provinces of				Provinces	
	Linares	Maules	Concepcion		Linares	Maules
Density	995.2	997.5	996.1	991.2	993.0	996.4
Alcohol per cent. in vol. . . .	10.9	12.2	9.2	11.4	11.8	10.3
Dry extract at 100°, per 1000 . .	19.74	28.68	17.84	23.35	14.50	21.00
Reducing substances, in glucose per 1000	1.41	4.34	1.85	1.07	1.78	1.8
Sulphates, in potassium sulphate per 1000	0.45	0.31	0.24	0.22	0.20	0.2
Potassium bitartrate per 1000 . .	4.03	4.40	2.33	2.68	2.91	3.2
Mineral substances per 1000 . .	2.80	3.12	2.92	1.40	1.92	2.4
Total acidity, in H ₂ SO ₄ per 1000 .	3.68	3.56	2.21	3.60	3.35	4.0
Volatile acidity, in C ₂ H ₄ O ₂ per 1000	0.54	0.56	0.85	0.47	0.74	0.5

the district producing inferior wines is chiefly that known as the Coast lera, which includes the provinces of Linares, Macule and Concepcion. ally it is the hill slopes that are planted with vines; these vineyards are watered, as the rainy season in this part is prolonged till sufficiently to the spring. French vines are here relatively rare, the old Spanish vines being still cultivated. They yield larger crops than the French but the wines made from their grapes are flat, without freshness or bouquet. Table III gives some examples of the composition of these wines. Samples were taken from new wines before the first racking.

Specialties. — To the north of Santiago, in the Provinces of Aconcagua and Coquimbo, the crop is used for the elaboration of special products — "chichas", liqueurs, raisins and brandy. "Chicha" is an exclusively Chilean product; it is grape-juice concentrated at 12°, 13° and 14° by being placed over an open fire out of doors, and then left to ferment spontaneously. This agreeable beverage is sold when it sparkles but has lost some of its sweetness, but has not yet acquired a high alcohol content. "Chicha" is made throughout Chile, but this northern wine with its different grapes (Alexandrian Muscats, white, yellow, rose, and other Muscats, Torontes, etc.) produces a kind which is especially prized.

TABLE IV. — *Composition of Chichas.*

	Santiago	Buin	Naucagua	Casquenes	La Calera
Specific gravity	1.036.4	1.057.5	1.027.6	1.040.0	1.080.0
Alcohol per cent. in vol. . . .	7.2	6.5	9.0	10.1	3.0
Extract at 100°, per 1000 . .	114.30	—	—	179.90	217.80
Organic substances, in glucose per 1000	95.6	117.60	84.4	171.00	207.00
Acid per 1000.	53.7	87.37	64.35	93.60	127.90
Base per 1000.	41.9	30.23	20.05	77.40	79.10
Mineral substances per 1000 . .	2.24	2.32	2.10	2.06	7.62
Acid of tartar per 1000	3.13	4.12	3.73	4.78	6.51
Free acid per 1000.	0.85	1.29	0.96	0.72	1.03
Acidity, in H ₂ S O ₄ per 1000	3.84	4.28	4.21	4.82	5.46

The sweet wines and liqueur wines produced in the Province of quimbo are not without their good qualities. Aromatic brandies known as "piscos" are also made in this district.

Raisins. — In Huasco and Elqui, raisins are made from *Alexandria* Muscats grown on trellises on the slopes at an altitude of from 3350 to 5000 ft. The climate there is particularly dry and warm. The grapes are gathered when fully ripe. They are hung up in special rooms, where they dry by the action of the natural circulation of the air. In two or three days the grapes are dry; they are then passed through boiling water for two minutes, and are subsequently drained, dried and packed.

Area under vines, and vine production. — The area planted in vines may be estimated at 250 000 acres; the vineyards are nearly equal divided into irrigated and non-irrigated plantations. The so-called French varieties occupy a surface of 160 500 acres, as against 56 500 acres planted with French varieties. The average production is about 154 million galls the whole number of vineyards.

Consumption and exportation. — At the present time, the Chilean wines are mostly consumed in the country. But it is interesting to note that there is also a considerable exportation of liqueur wines to Germany, of a good brand are those chiefly exported to Uruguay, Argentina, Bolivia and Brazil.

The value of the vines. — The value of the vineyards per acre, in irrigated zones, amounts as a rule to from £80 to £128 according to the district, the quality of the soil, distance from the railway, etc. In non-irrigated zones, the value varies between £16 and £32.

1202 — *The Wines of Tokay and a Comparison with those of Sauternes.* — *L'Annuaire de Viticulture*, Year 20, Vol. XL, No. 1024, pp. 129-135. Paris, July 1913.

The temperate district of Tokay-Hegyalja, in Hungary, is noted for a very excellent liqueur wine prepared from more or less shrivelled grapes not attacked by *Botrytis cinerea* ("Edelfäulniss" (1)).

Producing district. — The district of Tokay-Hegyalja, the Côte de Tokay, Hungary, is situated in the North-East of the kingdom in the County of Zemplén, comprising some 30 communes including those of Tokay; it must be added one commune in the County of Abony-Torna thus making 31 communes.

Tokay-Hegyalja is a range of hills extending from the extremity of the great plain of Hungary some distance from the Carpathians, for 5 to 10 miles, and containing an area of 12 450 acres of land occupied by vine cultivators.

The total production of this area averages about 1 760 000 galls and occasionally reaches 2 640 000 galls. Of this total only about one third reaches the high quality required for export, and of the export wine 95 to 98 per cent. is of the Szamorodni or Maslák brand; the

(1) See No. 418 B. April 1913.

akes up the remaining 2 to 5 per cent., the real essence of Tokay very rare.

e principal vine grown in Hegyalja is the Furmint, of which there are several varieties, all thick-skinned fruit free from moulds and suitable for dried grapes. Amongst the varieties of Furmint are the following: Blanc, Muscat Jaune (which gives the celebrated Asszu de Muscat), Red, Goat's Udder. They all ripen early; in good seasons some begin to colour at the end of July, and all are ripe in September. The qualities of wine are made in this district, from the ordinary Tokay, and the rare Essence.

Ordinary wines. — These are made from bunches containing no shrivelled grapes, or from which the shrivelled ones have been removed; although ordinary table wines, they have a very rich flavour.

Essence of Tokay. — The shrivelled grapes are gathered separately and in a vat having a small outlet at the bottom; through this flows a very concentrated juice, obtained by the pressure of the grapes themselves.

This juice gives the Essence of Tokay, which is very rich in sugar, contains little alcohol; in time it takes on a very marked aroma and a fine flavour; it is always rare.

Asszu wine. — This is the best-known of the Tokay wines, and is much esteemed as a dessert wine. It is prepared from a mixture of shrivelled grapes; the greater the proportion of the former, the richer the wine. For a very sweet wine, 5 hottes (2 to 3 ½ bushels) of shrivelled grapes are added to one barrel (28 to 30 gallons) of must. Asszu wines are made according to the number (2, 3, 4 or 5) of hottes of shrivelled grapes added to each barrel of must. The shrivelled grapes are first of all trodden alone in a vat and the resulting mass is thrown into another vat, with the correct amount of must and stirred vigorously; it is set for 12 to 48 hours according to the temperature, after which it is put into bags, trodden, and pressed; then the juice drawn off is put into casks. *Fordítás.* — The residue from the bags is placed in another vat and a small quantity of common must is added. After thorough mixing, the residue is left together for 4 or 5 hours, and is then put into bags and trodden. The residue is then pressed and a liquid obtained which produces a very fine wine but of less value than Asszu.

Szamorodni Wine. — This is prepared from bunches whose grapes are mostly shrivelled; they are trodden in bags and treated in much the same way as for Asszu. The residue is used in the making of Fordítás.

Iszap wine. — To prepare this, good Hegyalja wine is poured onto the residue remaining after drawing off the Asszu or Szamorodni wines. In this way the wine remaining in the lees is used to improve the ordinary table

Composition of the Must and the Wine. — Table I gives the composition of a sample of 1906 must (density = 1.113) from the vineyard of Tokcsva.

LE III. — Composition of wines of Tokay (Kramszky) in grams per 100 c.c.

	Ordinary wine of Tokay-Hegyalja from Tarszal, 1901	Sauternes from Sauternes 1901	Assé wine (shotter) from Tarszal, 1901	Assé wine (shotter) from Tallay, 1899	Essence from Tokay, 1901
Volume per cent.	14.39	14.77	12.23	13.13	7.11
Water	11.42	11.72	9.70	10.42	5.64
Alcohol, total ($C_2H_6O_6$)	0.76	0.94	0.96	0.62	1.23
Alcohol, volatile ($C_2H_6O_6$)	0.13	0.10	0.15	—	0.21
Alcohol, fixed ($C_2H_6O_6$)	0.60	0.82	0.77	—	0.97
Extract	3.16	7.78	18.74	9.26	33.73
Resinous bodies	0.29	2.60	13.40	5.75	25.77
Essence	0.16	1.82	6.85	2.88	13.90
Acetic acid	0.03	0.68	6.45	2.77	11.87
Malic acid	1.08	1.48	1.80	—	1.45
Formic acid, total	0.28	0.19	0.19	—	0.15
Formic acid, free	0.08	0.00	0.00	—	0.00
Salts of alkaline earths	0.07	0.16	0.13	—	0.05
Phosphoric acid	0.16	0.04	0.09	—	0.13
Calcium	0.02	0.015	0.03	—	0.024
Potassium	0.16	0.185	0.24	0.20	0.30
Carbonic acid	0.028	0.042	0.062	0.045	0.041
Optic rotation	—0.14°	—1.38°	—3.15°	—1.30°	—7.04°

Comparison of the Tokay wines with those of Sauternes. — The analyses of these various wines allow a comparison to be made between those of the Tokay district in general and the famous white wines of Sauternes, of which the method of preparation is quite different. Table IV contains analyses of the various types making a series as similar as possible to the Tokay series in regard to alcohol content. The figures refer to 100 c. c. of wine. No. 5 is a "head wine", harvested under conditions quite analogous to those of the Essence of Tokay, and made from over-ripe grapes without any

TABLE IV.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Alcohol, volume per cent . . .	14.8	13.8	13.8	12.9	8
Reducing sugar	0.550	2.630	7.140	14.070	30
Extract at 100°	2.320	5.780	10.300	19.620	.
Extract, reduced.	1.840	3.250	3.260	5.650	.
Acidity, total ($C_4H_4O_6$) . . .	0.682	0.787	0.750	0.550	0
Acidity, volatile ($C_2H_4O_2$) . .	0.050	0.070	0.080	0.085	.
Glycerine	11.465	1.465	1.815	2.450	0
Proportion alcohol-glycerine . .	3.080	13.270	16.440	24.020	13
Cream of tartar	0.118	0.115	0.140	0.135	.
Ash.	0.325	0.455	0.500	0.500	0
Rotatory Power	-1	-1	-31	-73	.

appreciable action of *Botrytis*, that is simply shrivelled. (1) No. 4 is a wine harvested in the same year with a very pronounced development of the fungus. Nos. 2 and 3 are "middle" wines and No. 1 a "tail" wine of good years.

Comparing the figures of the two tables, it is seen that in the Sauternes wines with equal or higher sugar content, the alcohol content is greater than in the Tokay wines; the initial sugar content of the must therefore has been greater also; for No. 5 this figure works out at 50 per litre, whilst for Essence of Tokay it is about 370 gms., or about the same as Sauternes wines from grapes attacked by *Botrytis*.

The fact that the fermentation goes equally far, and sometimes further at Sauternes than at Tokay, in spite of the excess of sugar, is probably due to the warmer autumn in the Gironde.

The acidity of the two wines shows little difference, but it is slightly somewhat less in the Sauternes. This is chiefly a question of the variety, though increased by the neutralizing action of the *Botrytis*.

In both cases the reduced extract is very high, and glycerine forms a considerable part of it. The proportion of glycerine per 100 of extract varies from 10 to 25 and this ratio varies directly with the quality of the wine except in the case of exceptional wines like Essence of Tokay.

(1) The year 1893 was very dry right on to September, and the *Botrytis* rot appeared by the time the grapes for this wine were gathered.

The writer explains the large amount of glycerine in Sauternes wines, firstly by the presence in the must of ferments capable of producing considerable quantities of glycerine, especially when acting in very concentrated musts; also because, before fermentation begins, more than 1 per cent. glycerine is found in the musts, which must have been produced by the action of *Botrytis cinerea* on the sugar of the grape.

The Tokay wines are richer in tartaric acid than the Sauternes, because they are more alcoholic, and *Botrytis cinerea* neutralises some of the acidity of the fruit.

A more obvious difference exists between the ash contents, those of Sauternes being twice as great as the Tokay figures. One of the most important influences in this direction is the concentration of the juice of the grapes attacked by *Botrytis*, which is greater than when they are simply pressed.

Again a very noticeable difference is accounted for by the use of sulphurous acid. The sulphurating of the stock is an indispensable operation in the vinification of Sauternes; and it is owing to the presence of sulphurous acid that the wines acquire and retain their wonderful properties. The addition of sulphurous acid to the Tokay wines in sufficient quantity would cause serious inconveniences, since the development of the aroma in the wine is dependant on energetic oxidation, which would be hindered by the presence of sulphurous acid.

Of the French wines, those of Montbazillac have most resemblance in their taste and colour to the wines of Tokay.

- Influence of Ferments on the Variations in Dry-Extract and Glycerine in Wine. — VENTRE, J. in *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 4, pp. 304-307. Paris, July 28, 1913.

During a course of researches carried out with the object of ascertaining the action of some elliptical ferments on the general constitution of wine, the writer was surprised to find that the ferments do not all behave in the same manner towards the extractives of grape must. His experiments lead to the following conclusions:

- 1) Every ferment has a specific action on the extractives contained in grape must. Some, the Champagne ferment in particular, seem to produce a noticeable diminution in the dry extract, comparable with the dilution produced by certain ferments in brewing. The Médoc ferment on the contrary gives a greater proportion of dry extract, without there remaining in consequence non-utilized reducing matter in the medium.
- 2) It would be interesting to know the variety of yeast which has transformed a must into wine, especially for research in adulteration by addition of alcohol; it would suffice if this attenuation of the dry extract corresponded to a high degree of alcoholic strength for the wine to be detected as one containing added alcohol.
- 3) The addition of sulphurous acid to the must diminishes to a great extent the attenuating power of certain ferments, especially that of Cham-

The writer proposed to investigate the cause of this diminution of extract and was led to determine the glycerine, with the following results:

a) Glycerine of organic origin is closely dependent on the ferment action on the medium. The proportion of glycerine formed varies between 3.5 and 4.1 per cent. of the initial weight of sugar in white wines, and between 3.6 and 4.2 for red wines.

b) In media to which sulphurous acid has been added, the quantity of glycerine produced were sensibly the same in all the experiments, whatever ferment was used. The proportion varied between 3.53 and 3.7 per cent. for white wines and 3.5 and 3.68 for red wines.

c) The variations of glycerine in the same medium are, according to the author's experiments, less than those found by M. Laborde, who reported considerable variations, according to the ferments, namely 2.5 to 7.7 per cent. of the weight of transformed sugar.

1904 - Plum Brandy. Improvements in its Manufacture. — ELLRODT, G. In *Schrift für Spiritusindustrie*, Year XXXVI, No. 30, pp. 373-374 + 2 figs. 1 July 24, 1913.

Plum brandy is manufactured in the Southern States of Germany chiefly by small farmers who frequently possess only small badly equipped distilleries.

The raw material consists of the fruit of different varieties of plums (*Zwetschen* or *quetsches*, fruits of *Prunus domestica* and *P. americana*) and also the different varieties of round plums (*Pflaumen*). The quality of the product depends chiefly on special aromatic substances in the fruit, on the content of amygdalin and on the method of preparation. The content of sugar, the most important constituent in distillation, varies according to the variety of fruit and the degree of maturity. According to Käppler it varies between 6.44 and 25.62 per cent. and averages 14.7 per cent. The yield of alcohol varies considerably in consequence, and on account of different methods of manufacture, which in some distilleries have remained unchanged for a century. The fruit is generally crushed, stones being left intact in two-thirds of the mass, crushed in the other third. In several districts however this last operation is not practised.

The crushed fruits are placed in barrels or cement troughs and allowed by means of the ferments adhering to the fruit to ferment spontaneously. Lactic and acetic acid bacilli also develop in the mass and may check the development or even destroy the natural fermentation of the fruit by an excessive production of acid. The result is that the fermentation of the sugar is incomplete and that a portion of the alcohol is transformed into acetic acid if the fermented mass is kept any length of time.

Experiments have been made to accelerate the fermentation by the addition of beer yeast and to check the bacterial action or diminish its effects. All these experiments gave increased yields of alcohol, but the quality of the final product was inferior to that produced by normal fermentation.

Some distillers have used compressed yeast. Better results might be obtained by the use of wine ferments in place of beer yeast either or compressed.

The enormous loss of alcohol which may result from spontaneous fermentation has been ascertained by experiments made at the Distillate Institute ("Institut für Gärungsgewerbe") at Berlin. The distiller who brought material to the Institute complained that the yield of alcohol was exceptionally small without apparent reason.

It was found that a good deal of fallen fruit was used in the preparation of the must, with the result that a much greater number of micro-organisms were introduced into the liquid, thus increasing the danger of fermentation.

Analysis of the must gave the following results.

TABLE I.

Density of fermented must	5.6° B.
Acidity	5.46°
" as acetic acid	1.638 gm. in 100 c. c.
Alcohol in filtrate	5.1 per cent. by volume
Unfermented sugar	0.6 per cent.

Calculating the quantity of acids corresponding to 100 c. c. of alcohol, an exceptionally high figure of 32.11 gms. is found. Allowing for the already present in the sweet must, which is not inconsiderable, remains a loss of about 20 per cent. of the total sugar due to the fermentation of acid.

Microscopic examination showed that the lactic and acetic acid organisms were numerous and fully active and that the ferment had been dead some time. To the loss of alcohol due to fermentation, the loss to distillation must probably also be added, because in some cases the apparatus used was very defective and often without an agitator. In this case, in order to prevent the fermenting mass from sticking to the walls of the still and burning, it is necessary to open the still in order to stir up the contents, which results in a considerable loss of alcohol. The means of determining the end of distillation is often so unsuitable that frequently alcohol remains in the residue.

Considering the high acid content of the fermented must, the writers have analysed from the distiller samples of the first distillation (crude product), of the second distillation (rectified) and tailings of the refined product (triple vie fine). The analyses are given in Table II below.

These results show that only a very small proportion of the enormous quantity of acid in the fermented must passes into the rectified product. The fermented must contains 36.04 gms. of acid per 100 c. c. of

TABLE II.

	Eau-de-vie crude	Eau-de-vie rectified	Tailings
<i>Results obtained:</i>			
Specific gravity at 15° C.	0.978 226	0.927 230	0.980
Percentage of alcohol in volumes determined with the alcometer %	17.7	54.36	15.1
Acids, as acetic, in 100 c. c. gms.	0.216	0.066	0.11
Index of total ethers.	20.1	38.3	6.6
" volatile "	18.6	38.3	6.6
" fixed "	1.5	—	—
Hydrocyanic acid, free. mgm.	traces	0.75	0.1
" combined	1.25	2.50	—
" total	1.25	3.25	0.1
Furfural reaction	present	present	present
<i>Results calculated per 100 c.c. of absolute alcohol:</i>			
Acetic acid gm.	1.121	0.121	0.81
Index of total ethers.	113.5	70.04	39.1
" volatile "	105.0	70.04	39.1
" fixed "	8.5	—	—
Hydrocyanic acid, total mgm.	7.06	5.97	3.26
" combined	7.06	4.59	—
" free	—	1.38	3.26

alcohol, the crude spirit contains 1.40 gm. and the rectified spirit 0.121. Of the ether which has passed into the crude product, none of the free substance and only a portion of the volatile, passes into the rectified liquid. Only combined hydrocyanic acid is present in the crude spirit and a small quantity of the free acid in the rectified product, and free acid alone in the tailings. This suggests that a hydrolysis of cyan compounds takes place during rectification, and explains why different

igators have not been able to demonstrate the presence of free cyanic acid in plum brandy, because the quantity probably depends on the degree of rectification to which the liquid has been subjected. In conclusion, only a small part of the great quantity of acids produced by foreign organisms during fermentation finds its way into the rectified brandy. There is no definite ratio between the formation of ethers and that of acids. In avoiding the development of acids by means of pure ferments, as is now generally practised, there is no risk of producing an inferior brandy. It is probable that the use of pure ferments of superior wines (which is now practised) to their products a fine characteristic aroma) would improve the quality of the brandy: at any rate the yield would be considerably increased.

PLANT DISEASES

GENERAL INFORMATION.

1205 - The First International Conference of the "Defensa Agrícola" at Montevideo (1). — Conferencia Internacional de Defensa Agrícola. — República Oriental del Uruguay, *Revista del Ministerio de Industrias*, No. 1, May 1913, pp. 77-84, 1 pl. Montevideo, 1913.

On the initiative of the Government of Uruguay, the First International Conference of the "Defensa Agrícola" was held at Montevideo from May 2 to 10, 1913. The Ministers of Foreign Affairs and of Industries of the Republic were Honorary Presidents (their delegate, Dr. Ed. Arce, being Acting President). The following States of South America were represented by their delegates and by experts: Argentina, Colombia, Chile, Paraguay, Brazil, Ecuador, Bolivia, Peru and Uruguay.

The text is given of the three Conventions drawn up by a technical commission and approved in final form by the International Conference. The first Convention consists of 15 articles, and deals chiefly with the damage caused by the locust *Schistocerca paranensis*. It arranges for an International Commission to be held before August 25 at Asunción, Paraguay; the objects of the latter are to study the centres of distribution and the concentration and diffusion zones of this locust and to propose (if it appeared necessary after a preliminary enquiry) the creation of a Central International Station with sub-stations for the purposes of a) determining geographically the concentration zones of *Schistocerca paranensis*; b) elaborating and presenting a control system suitable for the concentration zone, and (after the acceptance of this system) the directing of the necessary operations; c) informing all the countries interested of the movements of the swarms in order that they may take the necessary measures; d) drawing up and distributing frequently to the respective Governments reports on operations carried out, and upon everything which can be tried for the destruction of this injurious insect.

Matters relating to the pecuniary assistance and the reciprocal collaboration of the various contracting States were also settled, in so far as these concerned the working of the International Commission, the four

(1) See also No. 183, B. Feb. 1913.

and work of the Stations, the carrying out of a common control system, organisation of a service of telegraphic information respecting the motions of the locusts, and the exchange of information at the close of season.

By the provisions of the second Convention, which consists of 10 articles, the contracting States undertake to establish inspection services in their respective territories for the purpose of defending the interests of agriculture against plant pests. The latter are defined as follows: parasites, weeds, injurious birds and other animals, and all causes of pathological conditions, or of injury caused by cryptogams, insects and other animals, when they have assumed or threaten to assume a propensity for becoming likely to cause serious damage to plants.

As a result of the creation of the above-mentioned services, and for the purpose of the export, import and transit of agricultural produce, the States undertake to declare which ports are open to such importation and the measures of control to which these products will be subjected; to undertake to authorize no despatch of goods to the signatory countries, unless the prescriptions of the inspection services of the said countries have been carried out, and only to accept certificates given by official agents. The States will advise one another as to the officials authorized to issue such certificates, and respecting any modifications or changes in the latter. These certificates should contain a declaration that the original plantation or nursery is free from disease, and give the name of the owner or occupier of the land, its situation, the number and species of the plants, the port of loading and unloading and the name and address of the consignee.

Further, the States are expected to communicate to one another the regulations and regulations on the inspection service and any modifications of the same, likewise the existence and development of diseases, the occurrence of new diseases, and the disappearance of those already known, as well as every occasion of the refusal or destruction of imported products, the origin of such products, and the reasons necessitating the measures in question.

The second Convention also fixed that the second International Conference of the "Defensa Agrícola" should be convoked and organised by the Argentine Government, and held at Buenos Ayres. In conclusion, it provided for the installation at Montevideo of a permanent International Bureau, (the "Oficina"), entrusted with the supervision of the execution of the decisions made, and to serve as an intermediary between the different bureaux "Oficinas técnicas de Defensa Agrícola" of the various adhering countries.

This Bureau will consist of an agricultural engineer chosen by the Argentine Government, and of diplomatic representatives of all the countries of South America already accredited to the Government of that Republic. The working expenses will be divided proportionally among the contracting countries. The directing Committee of the Bureau will lay up the regulations.

The third Convention announces in the text that: On the denunciation or request of any one of the Governments, the other contracting countries shall be obliged to take prohibitive measures against the importation of easily-propagated diseases which are unknown in the production signatory countries, and this so long as they occur in the said countries and provided there are no practical measures of efficaciously disinfecting the substances which may convey the said diseases.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

1206 - The Cause Determining the Chlorosis of American Vines and the Method of its Control. — ACCARDI, SALVATORE. *La clorosi delle viti americane*, 10 Naples, 1913.

Chlorosis, especially in the case of American vines, may be transitory if it depends on cultural defects, or permanent, if it is due to the composition of the soil. Temporary chlorosis may be treated by abundant manure. Permanent chlorosis, in the opinion of the writer, should be mainly attributed to an insufficient absorption of magnesium on the part of the plant.

Magnesium is not wanting in any soil, but the carbonic acid circulating with the water in the soil dissolves with difficulty the double carbonate of magnesium and lime (dolomitic). When the magnesium occurs in this form, if any plant has not the power of directly decomposing this compound by means of the acid contained in its roots, it is deficient in the amount of magnesium necessary for the formation of its chlorophyll; hence the development of chlorosis.

The analyses made by Averna and Rossi show that Berlandieri vines and its hybrids contain more acid than *Rupestris* and *Riparia*, and also that the Berlandieri group has a greater power of decomposing the double carbonate of lime and magnesium than that possessed by other American vines. It is to this circumstance that it owes its chlorosis resistance (1).

Since however, according to Comes (2), nitrogenous substances in general, and manure in particular, diminish the acidity of the sap by increasing a larger amount of oxydases, especially in warm soils, it follows that soils which produce permanent chlorosis must never be treated with any kind of nitrogenous manure. Phosphates (which maintain the acidity) should be used, together with such quantities of magnesium as are necessary by local experiments.

In conclusion, it should be noted that though ferrous sulphate is a useful remedy for temporary or transitory chlorosis, it is of little use in the case of permanent chlorosis, owing to its weak action in displacing magnesium on being applied to the soil, and its slight and momentary catalytic effect when it reaches the chlorotic leaves.

(1) See No. 495, B. March 1912; No. 788, B. July 1913.

(2) See No. 881, B. July 1913.

- On the Presence of Endocellular Fibres in Healthy Vines and in those attacked by « Bramble-leaf ». — MAMELI, EVA in *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Series 5, Vol. XXII, First Half-year, Part 12, pp. 879-883. Rome, 1913.

In this preliminary note, the writer, basing her remarks on the results of studies made upon healthy and infected American and European vines, states that the presence of endocellular fibres, which is considered by Petri as the "constant index" of the "bramble-leaf disease" ("roncet" or "roncé", etc.) is not in her opinion "a symptom which is closely connected with the actual cause of the disease". Such fibres occur frequently, according to the writer, in healthy American and European vines, as well as in conifers and other plants, as has been demonstrated by Sanio, Müller, Raatz and Penzig.

In healthy vines, the writer states, the endocellular fibres occur equally in the higher and lower portions of the plant, and are found as frequently in the lower internodes as in the upper ones; while according to Petri these anomalies occur in the upper internodes only in plants which have long been affected, and "when the fibre formation takes place at the same time at the summit and base of the plant, the injury is more serious and more serious".

BACTERIAL AND FUNGOID DISEASES.

- Recent Researches on Vine Mildew (*Plasmopara viticola*). — Communicated by Dr. Gy. DE ISTVÁNYI, Professor at the University, Director of the Royal Hungarian Ampelological Institute, and Gy. PÁLENKÁS, Assistant.

. Development of mycelium and conidia. — The germinating tube of the spores of *Plasmopara viticola* always penetrates the green parts of the vine through a stoma; in the cavity below the stoma the hypha swells considerably and the whole of the protoplasm collects in this swollen part: a secondary spore thus produced soon throws out a haustorium, which penetrates the nearest cell of the parenchyma, and then develops a narrow tube (3 to 5 μ), which ramifies in the intercellular spaces and produces numerous haustoria. By the third day a definitive mycelium is formed. As the pores send out hyphae which penetrate several stomata, each "grease spot" is caused by as many young mycelia as the zoospores which succeeded in penetrating. The growth of the hyphae is generally in a radial direction, so that obstructions such as vascular bundles are met with by a flattening out of the hypha and the development of narrow hyphal threads which pass above or below the vein and continue their way as before. The mycelial threads may take the form of 1) cylindrical tubes, sinuous and narrow-walled; 2) vesicular tubes with irregular swellings (during damp weather: coralloid type); or 3) slightly flattened tubes often tapering and

) See No. 968, B. June 1912; No. 1349, B. Sept. 1912; and No. 67, B. Jan. 1913 [Ed.].

with irregular dichotomous branching. The hyphae are always aseptate and never join together. The nuclei (1.5 to 3 μ) are numerous and scattered irregularly; they form clusters at the bases of the branches and the tips of the young hyphae. Generally they are round, but when developed rapidly they become fusiform in shape.

The haustoria occur irregularly and are sometimes united in groups. Haustoria with long pedicels were previously unknown. They also possess a nucleus, which ultimately divides.

After the mycelium has developed, it sends out smaller filaments in the stomatic chamber, which form conical masses and raise the surrounding tissue. Under favourable conditions (heat and sufficient moisture) these filaments from these hyphal masses pass out through the ostiole of the stoma become swollen and present the appearance of young conidiophores, either 1) isolated, 2) joined together in a strawberry-like mass, or 3) with the ostia forming pear-shaped swellings which give rise to conidiophores. When these filaments begin to extrude, the nuclei advance in quantities, and the dense protoplasm containing them passes into the branches.

After a short period of growth a slight swelling appears just below the tip, and into it the protoplasm condenses. At the time of migration the nuclei are in a rapid state of division and are fusiform, elongated or boot-shoe shaped. In the course of the development of these swollen parts (which represent the stems of young conidiophores), appear first primary and later secondary branches which terminate in trifid sterigmata. (At the base of these branches we have observed finger-like bodies, hitherto unknown, which are probably rudimentary sterigmata). Fructification begins immediately, the first conidia forming after 4 to 6 hours on the sterigma of the lower branches. Under favourable conditions fructification is completed within 10 or 12 hours.

We have observed by staining that the first protoplasm to pass into the sterigma to the young conidium is not very dense; it is followed by a denser part, generally containing the nucleus. This nucleus then divides several times. In the development of the conidia there are three distinct periods: 1) the conidium has reached its full size and the nuclei begin to divide, though the conidium is not ripe; 2) after 3 or 4 hours from the appearance of the young conidia karyokinesis ceases; the conidia are ripe and if placed in water cannot produce zoospores for a long time; 3) the protoplasm takes the form of a network, the nuclei take up definite positions and the conidia become fully matured. These facts account for the variation in virulence and the numerous differences recorded by various observers concerning the liberation of the zoospores.

The practical importance of this is that the conidia only become virulent after a period of about 24 hours. Thus it follows that the conidia produced in the morning after evening rain, cannot produce infection until rain also falls during the afternoon or night following. Thus fresh infection may be avoided by spraying immediately. With a mist the conidia begin to germinate even before dropping from the conidiophores, which explains why mists are so harmful.

We have already (1911) described the cover or lid of the conidium. At germination this lid is forced up by the zoospores, which then effect escape.

At a temperature of 6° to 8°C. they maintain their vitality for 3 to 8 days, but do not survive drought for more than 5 days; dry weather following abundant rain is particularly destructive of thin-walled conidia.

In studying the effect of copper salts, we find, 1) that a solution of 1 to 10 000 of copper sulphate hinders germination, but that the conidia can germinate in a solution three times as concentrated as that indicated by Det and Gayon; 2) that in the most dilute solution the formation of zoospores is considerably retarded (as much as 12 hours).

In artificial media the development of zoospores ceases at the time of liberation from the conidia, which has been observed to take place after 24 hours in the different solutions employed (bouillon, sweet wort, liquid manure, hay extract, etc.), diluted from 5 to 10 times.

3. *The period of incubation.* — This is defined as the period between the liberation of the zoospores and the appearance of the first symptoms of the disease on the plant (grease-spots on the leaves; yellowish-brown spots on the stems, tendrils, etc.).

The length of the incubation period depends on the temperature and humidity of the surroundings; for leaves it diminishes as spring advances; at the beginning to the middle of May it is 15 to 18 days; at the end of May 12 to 15 days; at the beginning of June, 11 to 13 days; at the middle of June, 9 to 11 days; at the end of June, 6 to 7 days; and in July and August 5 to 6 days, provided the weather is normal.

On the bunches the duration of incubation varies as follows: from the middle of May to the beginning of June, 12 to 14 days; at mid June, 9 to 11 days; at the end of June, 10 to 12 days; in July 12 to 14 days. It is longer than 15 days if the infection takes place on the stalks of the grapes or on the main stalk of the bunch, as in this case the mycelium has to traverse the intermediate tissues, so that in July the period of incubation may be from 15 to 19 days.

During warm weather the incubation period may be so much shortened, following abundant rain, that the grease-spots do not show before the mildew has set out. In this case the period of incubation on the leaves is 10 to 12 days at the end of May, 8 to 10 days at the beginning of June, 6 to 8 days at mid June to the end of the month and 4 or 5 days in July and August; on the branches it is 9 to 11 days in the first half of June, 7 to 9 in the second half and 8 to 10 days in July. In such cases the vine growers believe that infection takes place during the rain on the day previous to the appearance of the mildew. This idea is erroneous, as infection always takes place 4 to 6 days sooner, and rain immediately before the appearance of the symptoms has only the effect of reducing the period of incubation.

3. *Grease spots.* — These are the yellow or pale green transparent spots which appear on the green parts of the diseased plant immediately after the development of the mycelium, owing to destruction of the chloroplasts. On the fruits and old shoots the point of infection assumes a greyish or

brownish tint. The true "grease spot" appears along the edges and midrib of the leaf.

The shape and size of the spots depends generally on the weather, the variety and the growth of the leaves; in cold or wet weather the spots are large and round; with drier weather they are smaller and more angular. On susceptible vines they are larger than on resistant varieties. After the appearance of the spots the first rain starts the development of conidia which form the mildewed appearance on the diseased patches. The incubation period of the mildew is dependent upon the humidity; in dry weather it takes from 4 or 5 days to 12 or 20 for its appearance, and if there is no rain at night it may not appear at all.

4. *Infection experiments.* — All the young and green parts of the vine (including leaves half an inch in length) can be infected in the laboratory as well as in the open air. The success of the infection depends on the state of the plant, the virulence of the conidia and the local conditions. Infection can be produced on the surface of the leaf, but only along the larger veins and indentations. The susceptibility of the plant depends on the supply of water in the organ, the vapour tension in the stomata, the cell walls and intercellular cavities generally, the turgescence of the cells, and to some extent on the chemical composition of the cell sap.

In June 1911 we carried out artificial infection experiments on bunches in the open air and described them in August of the same year. We found that infection rarely takes place on fruits the size of a pea, because of a suppression of some of the stomata.

By means of conidia preserved for 3 weeks in an ice-room (at 6° to 8°) we have been able to cultivate the fungus throughout the winter on the branches; by retarding the appearance of the mildew we have succeeded in preserving the mycelium in the "grease spots" in a latent condition during 7 or 8 weeks. Under suitable conditions of warmth and humidity the incubation period is the same under glass as in the open.

5. *Bearing of the incubation period on practice.* — Attacks of mildew take place after rain, thick fog or heavy persistent dew; the appearance of the mildew also occurs after rain; consequently the development of the disease depends on two rainfalls. It is therefore necessary to apply the sulphur at least after the appearance of the grease spots.

To detect the presence of the grease spots, before their appearance in the vineyard, the suspected leaves are first sprinkled with water and then covered up and kept in a warm dark place. The bunches are wrapped in moist filter paper and placed in a warm damp chamber. After a few days the mildew breaks out on the suspected material and the disease is easily recognised.

6. *Use of the incubation calendar and trials.* — The grower should note any appreciable rainfall (say half an inch) between the end of April and the beginning of May and allow for the incubation period 15 to 18 days. He gives the date of appearance of the grease spots due to infection from the spores. He must also notice if the temperature falls below 10°C. (50°F.) as the disease cannot develop below this temperature. The artificial

should be made 5 or 6 days and again 2 or 3 days before the expiration of the date of incubation (with both leaves and fruits).

In calculating the date of incubation, only the rainfall of two or three days may be taken together and the period must be reckoned from the first day of rain. From mid-June onwards even small showers must be noted. Heavy showers are the most dangerous, and it is then that the vines require attention.

Conditions Favourable to the Development of Mildew. — MENGEL, O. *Evolution du Mildew suivant les Conditions de Milieu.* — *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, Second Half-Year, Vol. 157, No. 4 (July 28, 1913), pp. 292-294. Paris, 1913.

From observations made in France it appears that infection by mildew is due to a) general causes; b) secondary causes depending on the nature and situation of the vine, and on its adaptation to local conditions, such as the position and exposure of the soil; c) accidental causes (such as manure, drainage of the soil, etc.).

As the general causes are bound up with atmospheric variations, meteorological observations are required to provide warnings and timely information. Preventive measures can always be successful in normal years; periods of infection do not overlap each other, as happened this year in Roussillon (Pyrénées Orientales).

For secondary and accidental causes, it is necessary to make researches into the variations in the development of the disease. For example, the variety Grand-noir will remain free from disease though surrounded by the more susceptible variety badly infected; and the Carignan of Salanque (1), growing in a region of normal humidity, will be protected from infection by treatment with copper sulphate, owing to its adaptation to the local conditions, whilst the more susceptible variety of Carignan, growing in soil accidentally inundated, would require double the treatment.

Since the spores of mildew, like those of all Phycomycetes, are disseminated by the least breath of wind, one would expect to find them in great numbers to cause infection in any position. The writer has no direct evidence for believing that a district previously infected with mildew is not more liable to infection than any other, provided that the local conditions previously favourable to the development of the disease no longer exist. Nor does he think that a hill-side situation is more liable to infection when it faces winds coming from previously infected areas. Further, in Roussillon this year the prevailing winds during the infection period came from the sea and the most badly mildewed districts were precisely those which were exposed to these sea breezes almost free from contamination with spores; this is accounted for by the writer as being due to the damp breezes accelerating the germination of the spores; no doubt the rigorous treatment with the fungicide would have kept it in check. The vine-grower should therefore be acquainted with the modes of

action of these secondary and accidental causes and be able to act accordingly. It is well known that tillage during the period of infection is disastrous; consequently this operation must be postponed, or if urgent, a dressing of sulphate of copper must follow immediately behind the plough. In manured vineyards it will be advisable to double the treatment or to partially defoliate the plants to let more air into the bunches. In this way the accidental causes are prevented from creating local conditions similar to those of the general causes.

1210 - Comparative Spraying Experiments with some Commercial Fungicides

— BRETSCHNEIDER, ARTHUR. Vergleichende Versuche mit einigen Spritzmitteln gegen die Blattfalkkrankheit (*Peronospora viticola* De Bary) des Weinstockes. — *Zeitschrift für das landwirtschaftliche Versuchswesen in Oesterreich*, Year XVI, Part 6, pp. 765-770, Vienna, 1913.

In 1912 comparative experiments were carried out in various parts of Austria with Bordeaux mixture (1-2 per cent.) and the following commercial fungicides: "Floria-Kupferseifenbrühe" (3 per cent.), "Forhin" (1-2 per cent.); but the formula does not correspond with that given by the maker and "Perocid" (1-2 per cent.), chiefly against attacks of vine mildew (*Plasmopara viticola*), but also (at Znaim) against *Pseudoperonospora cubensis* on Cucurbitaceae and certain fungi on fruit trees (*Fusicladium Monilia*, etc.).

The wetting power of all these preparations was found to be very good. The writer does not consider the visibility of the spray on the leaves very important; for this point Bordeaux mixture comes first, followed in order of merit by "Floria-Kupferseifenbrühe", "Perocid", and "Forhin". For rapidity of preparation, the order is: "Floria-Kupferseifenbrühe", "Forhin", "Perocid". All the solutions were neutral and harmless to plants, with the exception of "Forhin" on one occasion, and they had advantages over Bordeaux mixture in being ready for immediate use and requiring testing for neutrality. They were also generally in a very good state of division. Bordeaux mixture at 2 per cent. alone gave thoroughly satisfactory results in 1912 as a fungicide. With all the other preparations the mildew developed more or less vigorously. Arranged in order of merit with regard to their fungicidal properties they are as follows: Bordeaux mixture at 2 per cent., then at some distance Bordeaux at 1 per cent., "Forhin", "Floria-Kupferseifenbrühe" and "Perocid". The inferiority of the last-named mixture is due to the low concentration of the liquid. "Floria-Kupferseifenbrühe" and "Forhin" are the most expensive and "Perocid" the most economical in price.

1211 - Some Interesting Cryptogamic Diseases which Appeared in Hungary in 1912.

— FATEK, B. Mykologisches aus Ungarn. - *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Part 5, pp. 260-262. Stuttgart, August 20, 1913.

The year 1912 was the most favourable for the development of cryptogamic diseases which can be remembered in Hungary. The writer has carried out some researches at Klausenburg (Kolozsvár), records from which place eight species of fungi, all interesting from different points of view.

Puccinia graminis ; this appeared for the first time on rye, after the had sought for it in vain for about 20 years ; the harm caused was, er, not great.

Puccinia Malvacearum, also observed for the first time, on marsh *(Althea officinalis)*. It attacked, but only slightly, plants of one f age ; those from 4 to 5 years old were immune.

Epichloe typhina, already recorded before 1912 as occurring on *yrum repens* ; this fact is doubly interesting, because on the one hand ngus had not yet been registered in the literature on the subject, 1 the other, the parasite proved useful in arresting the development of ed ; preventing it flowering and fruiting.

Puccinia bullata, very common on cultivated specimens of *Conium atum* as in 1911 ; the uredospores appeared in May, and the teleuto- ; during the second half of August, not only on the stems and leaves, so on the inflorescences.

Plasmopora nivea on the same plants of *Conium* ; wild individuals Umbellifer growing close to the cultivated specimens remained en- immune, and as the latter were growing in rich well-manured soil, ears that their excessive vigour rendered them more susceptible to tacks of the disease.

Phoma foeniculina, very common on fennel, as in 1911 ; the infected ore smaller and fewer seeds than the healthy ones.

Puccinia Menthae on *Mentha canadensis* var. *piperascens*.

Oidium quercinum on oaks ; these have been attacked by the fungus 910 ; the old trees were immune.

Sclerotium Oryzae on Rice in India.—SHAW, F. J. F. A Sclerotial ase of Rice. — *Memoirs of the Department of Agriculture in India*, Vol. VI, No. 2, 11-23, 1 fig., plates I-III. Calcutta, July 1913.

Sclerotium Oryzae was first described by Cattaneo in 1879 as damaging Novara and Lombardy. It was discovered in Japan in 1910 by and during the past year it has been found in various parts of India. lected plants can be distinguished from their healthy neighbours ormally prominent tillering, a fact that appears to have been over- by previous workers. Later the infected culm gradually turns yel- d dies and the ears are poorly developed and empty. Within the stem at the base a dark greyish web of hyphae is visible with small clerotia dotted over the surface.

ie writer describes his preparations of the fungus in pure culture and earance on various media. Inoculations of the pure cultures on sted- ings gave positive results.

ie author concludes by pointing out the differences between his itions and those of previous workers on allied species and draws on to the interesting changes in colour and form of the hyphae grown different media.

medial measures against such a parasite as this do not appear to be able, and the writer suggests the breeding of resistant varieties as y method of dealing with the disease.

- 1213 - *Lasiodiplodia Theobromae* parasite on Cacao in Dahomey.
BERTHAULT, PIERRE. Sur une maladie du Cacaoyer dans l'Ouest Africain. - *Economie Coloniale, Bulletin mensuel du Jardin Colonial, Nouvelle Série*, Year 1, N° 8-14, figs. 1-3. Paris, July 30, 1913.

The cacao plantations in Dahomey have been ruined by a disease known locally as "sun-stroke" or "apoplexy", which attacks the root, trunk, branches and destroys in a few days otherwise healthy and productive trees. As a result of his examination of the disease the writer concludes that it is due to a parasite, *Lasiodiplodia Theobromae* (Pat.) Griffon et Maubl.

He suggests experiments to test the efficacy of copper mixtures, lime-sulphur, and disinfection of the soil by carbon disulphide injections. Further studies on this subject are required.

- 1214 - "Soft Rot" of Bulbs of *Ixia maculata* and *Gladiolus Colvillii* induced by *Bacillus Ixiae* n. sp. and *Pseudomonas Gladioli* n. g.
SEVERINI, G. Una bacteriosi dell'*Ixia maculata* e del *Gladiolus Colvillii*. - *Annali Botanica*, Vol. XI, Part 3, pp. 412-422, plate VIII. Rome, 1913.

In April 1912, the writer observed a soft rot on bulbs of *Ixia maculata* and *Gladiolus Colvillii* resembling a bacterial disease. All the plants (the bulbs obtained from Holland), though grown in quite separate houses, showed signs of the disease simultaneously, at the time of appearance of the first blooms.

The symptoms of attack begin with a yellowing of the tips of the leaves extending longitudinally to the base, and finally the whole leaf turns yellow. Livid purple spots then appear, quite distinct at first, but later change into a greyish black mass. The whole shoot is easily detached from the bulb, and may fall to the ground of itself. On superficial examination, the bulb appears normal, but within the outer sheath it is covered with yellow or reddish spots and is found to be flaccid and full of a soft granular mass. The disease attacks young bulbs equally with the old ones.

The writer has obtained pure cultures of the organisms present in the diseased tissue, and out of five bacteria which he isolated he found that three were capable of producing the disease by artificial infection. Two of these organisms occurred on *Gladiolus* and the two others proved to be one species capable of producing the disease in either *Gladiolus* or *Ixia*. The organism from *Gladiolus* he named *Pseudomonas Gladioli* and the one common to both *Bacillus Ixiae*.

The above organisms are capable of producing "soft rot" of the bulbs and leaf sheaths. They are confined to the intercellular spaces of the parenchyma, where, by dissolving the median lamellae they produce a complete separation of the cells. They do not alter the cellulose walls or the contents of the cells, but the protoplasm is soon poisoned. *Bacillus Ixiae* appears to attack the pectic matter of the median lamellae more vigorously, while *Pseudomonas Gladioli* exerts a greater toxicity towards the protoplasm.

(2) See also No 316, B. Jan. 1911, and No. 616, B. Feb. 1911.

The writer also found that both organisms can produce the disease in plants, but that the power of adaptation is less with *Bacillus Ixiae*. Infection, under natural conditions, probably takes place through the base of the bulbs, where the micro-organisms can readily gain entrance. The conditions necessary for the progress of the disease are a temperature of 20 to 30°C. and great humidity.

As preventive measures the writer recommends: a) using only bulbs from uninfected districts and storing them in a dry airy place; b) disinfecting the bulbs by plunging for 15 minutes in warm water at a temperature of 50° to 55°C. (122° to 130°F.); this does not hurt them, while the organisms are killed at 47°C. (117°F.); c) mould and pots that have been near infected plants should be discarded and the frame disinfected with formalin or lime; d) the plants must have a free circulation of fresh air, plenty of light, and not too much moisture.

- Dik-voet, Club-root, or Finger-and-toe (*Plasmodiophora Brassicae*, Woronin) in South Africa. — POLF EVANS, I. B. in *The Agricultural Journal of the Union of South Africa*, Vol. VI, No. 1, pp. 93-97, plates V-VII, Pretoria, July 1913.

This is the first report of the occurrence of this disease in South Africa, but it has undoubtedly existed during the past 10 or 15 years. The writer of the present outbreak in the Cape Province emphasises the importance of greater vigilance on the part of the farmers and of a more ready communication between the cultivator and scientific expert in the control of such diseases.

Up to the present it has not been observed as occurring on turnips in South Africa, though this is the crop most frequently attacked in England. The particular outbreak appears to be nearly confined to cabbages and cauliflowers.

The writer describes the characters of the disease and the usual preventive measures.

- "Ferrugem da pimenteira" (*Puccinia Capsici* n. sp.) on Various Species of Capsicum in the State of Sao Paulo, Brazil. — AVERNA-SACCA, CARLOS. — *Ferrugem da pimenteira, Puccinia Capsici* n. sp. — *O Fazendeiro*, No. VI, No. VII, pp. 258-259, 2 figs. S. Paulo, July 1913.

Puccinia Capsici n. sp., which appeared for the first time in 1909, is a serious pest of capsicums in various parts of the State of Sao Paulo of various types of soil; plants in damp and shady situations are, however, most liable to the disease. Up to the present it has been recorded on *C. baccatum* (pimenta da China), *C. frutescens* (pimenta cumarim), *C. pendulifolium* (pimenta malagueta), and *C. microcarpum* (pimenta cumarim miuda), but not yet on *C. grossum* (pimentões); it is probable, however, that the latter is equally susceptible, because hardier and consequently more resistant varieties like those above mentioned are not immune to the disease.

This fungus attacks all parts of the plant; on the stalks and branches of 1-2 years' growth it produces fruiting pustules, resulting in lesions and withering of the parts affected. The terminal buds are attacked most

severely and become deformed and shrivelled. The leaves become covered with distinct spots, corresponding to fruiting bodies on the under side; they soon curl up and eventually wither. The flowers are also attacked particularly on the peduncle and calyx; attacks on the peduncles occasion loss of fruit.

1217 — A Die-back Disease of Douglas Fir produced by a Variety of *Sphaeropsis Ellisii*. — PETERS, L. in *Annales Mycologici*, Vol. XI, No. 3, pp. 174, figs. 1-3. Berlin, 1913.

In the spring of 1912, a large number of Douglas firs, which had been planted 5 to 7 years ago in fresh sandy soil protected by a cover of Scots pine at Grezzano nel Mugello (Tuscany), at 1000 ft. above sea-level, showed a drying up of the tips of the branches. This drying up of the branches ended abruptly a short distance from the summit of the tree and at the point of separation between the dead twigs and the part still green a mycelium could be detected, which spread into the cortical tissues. When kept in a moist chamber, pycnidia developed and the fungus was identified as a variety of *Sphaeropsis Ellisii* Sacc., a species of fungus having a distinct form identified by the host plant rather than by morphological characters.

The variety on *Pseudotsuga* differs slightly from the known variety of *Sph. Ellisii* in the dimensions of its spores, and approaches near the variety *Abietis*.

The writer has not yet obtained the germination of the spores in nutritive media.

The chief cause of the outbreak appears to be attributable to the position of the trees attacked; in spite of the south aspect, they have no sufficient light, and grow in an excessively moist atmosphere. At a distance of 50 yards, on the same soil, there are thousands of Douglas firs of the same age, but not shadowed by any other trees, and all are perfectly healthy.

Although direct observation has not yet been made, it is possible that the infection of the Douglas firs took place with spores of *Sphaeropsis* from the branches and cones of the *Pinus sylvestris*, and that the fungus developed on the young trees owing to the special conditions of humidity and temperature.

Successful experiments to prevent infection have been carried out by spraying with a 1 per cent. mixture of lime and copper sulphate.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS

1218 — *Avena fatua* and other Species of *Avena*, with their Hybrid Weeds of Cereal Crops in France in 1913. — RABATÉ, E. La folle avoine. *Le Progrès Agricole et Viticole*, Year 33, No. 32, pp. 116-130, figs 1-5. Montpellier, August 10, 1913.

Avena fatua (the wild oat), with other wild annual species of *Avena* (*A. barbata*, *A. strigosa*, *A. sterilis*, *A. Ludoviciana*) and hybrids between these and *A. sativa* (the cultivated oat) — all known in France as

e" and common weeds of grain crops in the south-west and south of country — has been very prevalent in the crops this season, after a mild winter and rainy spring.

The losses to farmers have been very considerable. In some fields the grain had to be cut green in early June to prevent the wild oat seeds from shedding.

From his own observations on some fifty farms, and from reports received, the writer considers that there are good botanical characters for distinguishing the seeds of *A. sativa* from those of the weed species, but the work becomes hopeless for certain hybrids which are very close to the cultivated oats.

Severe winters destroy the weed species in large quantities.

The deep ploughings of 1912 favoured the great invasion of 1913. After deep work it is well to take either a spring root crop or a marketable crop before cereals, as such a crop allows the wild oats to come up in abundance, and they soon get destroyed by the repeated hoeings.

Ploughing the stubble after a very foul crop of wheat only induces the germination of quite a few seeds of wild oats; the majority remain dormant in the soil for many years. Summer ploughing on over-dry land favours the development of wild oats in the grain crop following. On badly infested land, wheat and red clover ("trèfle violet de Hollande") must not be sown for several years; on such land smothering crops, such as rye, lupine, temporary leys, rape and mustard, should alternate with well tilled crops and green crops cut before the wild oats flower. On such land it cannot do better than after two cleaning crops in succession, either a root crop and a root crop, or two root crops.

Commercial oats containing grains of hybrids of weed species with wild oats should be crushed before feeding to stock.

For control measures the writer advises: hand-hoeing in February or March; horse-hoeing of cereals in drills in February, followed by spraying with 10 per cent. sulphuric acid; pulling up of tufts in April and May; cutting of the ears in early June; cutting green followed by ploughing; and the collection of chaff which may contain wild oats; and lastly firing the

INSECT PESTS.

Leucopis nigricornis, a Natural Enemy of *Pulvinaria camelicola*. — MALENOTTI, ETTORE. Sopra un nemico naturale della "*Pulvinaria camelicola*". Sign. — "*Redia*", Vol. LX, Part I, pp. 113-155. Florence, August 28, 1913. Some specimens of *Pulvinaria camelicola* collected at Ascoli Piceno on the leaves of orange trees and forwarded to the Royal Station of Agricultural Entomology at Florence, were found to have deformed ovaries. The writer discovered this to be due to the presence of dipterous parasites feeding on the eggs. The writer reared these parasites early in June and identified the fly as being *Leucopis nigricornis*, a species already re-

corded as a parasite of insects in Hawaii and the United States, but which is not very common and of whose habits little is known. It appeared for the first time in Italy at least, *Leucopis* had not before been recorded as a parasite of *Pulvinaria camelicola*.

1220 - *Aelia acuminata*, a Hemipterous Pest of Cereals in Algeria. — VIGNY, P. Un ennemi de plus des céréales. — *Revue Agricole et Viticole de l'Afrique du Nord* (Algérie-Tunisie-Maroc), Vol. II, No. 71, pp. 644-646. Algiers, July 19, 1913.

During May and June, the grain crops (wheat and barley) in several districts of Algeria were reported to be attacked by an insect which pierces the soft unripe grains and caused them to dry and shrivel upon the ear. The writer identified the insect as *Aelia acuminata* (Hemiptera), which occurs normally on uncultivated land, but which in certain seasons multiplies rapidly and seeks food in neighbouring cornfields.

The writer recommends sowing the corn in separate strips so that the workman can pass between and collect the insects in a butterfly net. In this way many insect pests can be collected and destroyed by burning. Gatherings at intervals of 8 or 10 days are generally sufficient to remove the bulk of the insects. The cost of collecting and burning the insects amounts to only about 4d an acre.

1221 - *Heterodera radiculicola* on the Roots of *Scirpus sylvaticus* in Silesia. — OBERSTEIN, O. Eine neue Älckengalle an den Wurzeln der Waide (*Scirpus sylvaticus* L.). — *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Part pp. 262-264, figs. 1-2. Stuttgart, August 20, 1913.

In the spring of this year, Dr. A. Lingelsheim found nodular and fibrous swellings on the roots (chiefly the lateral ones) of *Scirpus sylvaticus* growing in the Botanical Gardens at Breslau. It was found that these swellings were due to the presence of *Heterodera radiculicola* Greeff. This discovery is interesting because gall-like formations have not before been recorded on the genus *Scirpus*, and also because *S. sylvaticus* is a new plant host of this widely spread nematode.

1222 - The Hop Aphis in the Pacific Region. — PARKER, WM B. — *United States Department of Agriculture, Bureau of Entomology, Bulletin No. 117*, pp. 43 + figs. + plates. Washington, May 1913.

The hop aphis (*Phorodon humuli*), known as a pest in Europe long before hop growing became an industry in America, is now a troublesome pest in most of the hop-growing sections of British Columbia, Washington, Oregon and California.

The writer gives the results of his observations and experiments made in Sacramento and Santa Rosa (California). From a series of observations on the biology of the insect and its relations to its host-plants (hop, plum, cherry, peach, apple), he describes the life history as follows.

Two generations are produced on the hibernating host plant, the first of which is winged; five or six generations occur on the hop; some of the fifth generation are winged and give rise to the hibernating generation, whilst others remain wingless and give rise to a sixth generation of winged

Percent	Materials used	Pressure	Percentage killed.	Cost per 100 gals.
		lbs.		
	Nicotine sulphate 1 in 3 000	80-100	99.9	\$0.416
	Nicotine sulphate 1 in 3 000; with whale-oil soap, 4 in 100	80-100	99.2	0.80
	Nicotine sulphate 1 in 3 000; with cresol soap, 1 in 300	80-100	95	0.83
	Tobacco waste, 25 lbs. to 100 gallons water	100	100	0.18
	Quassia 9 lbs., whale-oil soap 6 lbs., water 100 gallons	—	—	0.74

s on the hop; these winged males of the sixth generation follow the females of the fifth generation, which produce eggs and give rise to the first generation the following spring. The eggs are laid on leaf or leaf scars.

The aphides live chiefly on the under side of the leaves and are only found on the upper surface during a bad attack; later they migrate to hop cones. The spread of the attack is facilitated by ants (*Formica ruginosa* Say), which cultivate them for the honey-dew and carry them to young shoots for fresh feeding grounds.

Damage to the hop plants is brought about in two ways: 1) by sucking juices of the plant, and 2) by the growth of a black smut (*Cladosporium*) in the sugary secretion, which deteriorates the value of the harvest, rendering it worthless.

Amongst the natural enemies of the hop aphid are the following: *Podania convergens* Guér., *Coccinella californica* Mannh., *C. abdominalis* Chilocorus orbus Cas., *Chrysopa californica* Coq., *Syrphus opinator* L., *S. americanus* Wied., *Triphleps insidiosus* Say, *Adalia bipunctata* L., *Corvus punctum* Lec., *Camptobrochis nebulosus* Uhl., *Anthocoris* sp. In the case of these enemies the spread of hop aphid has never been adequately checked and contact sprays are generally adopted, especially decoctions of tobacco or quassia and whale-oil soap.

Spraying should take place in the springtime as soon as the aphides appear on the plum or other fruit tree, then again in the autumn to reduce the attack on the hops. Twice to four times is necessary in the autumn to keep down the numbers of the aphides, and each time the greatest care must be taken to reach both sides of the leaves. Very careful spraying has been known to save the crop from serious attacks.

Details are given of several experiments made with different insecticides and of the technique of spraying. Flour paste is specially recom-

mended in place of soap as being cheaper and quite inoffensive. It is made by mixing a cheap flour with cold water until a smooth thin butter is obtained. This is diluted until it contains 1lb. of flour to each gallon of water and is then cooked to a paste, sufficient water being added to make up for evaporation; when mixed with the insecticide the flour paste has a tendency to settle, so that constant agitation is necessary.

The table on the preceding page gives the most important mixture for use with a compressed air sprayer.

From 300 to 500 gallons per acre are required and one machine will spray from 2 to 3 acres per day. The total cost of spraying 500 gals. per day of the nicotine sulphate flour-paste mixture amounts to \$6.79 per acre whilst the quassia and whale-oil soap mixture amounts to \$7.25 per acre. Stripping the vines before spraying will cost from \$1.80 to \$2 per acre.

A bibliography of 34 works is appended.

- 1223 - *Aphrophora spumaria* on Roses and Pinks. — MOLINAS, E. L. *Aphrophora spumaria* sur les œillets d'Antibes. — *Journal d'Agriculture pratique*, 1913, Vol. I No 31, p. 155. Paris, July 31, 1913.

Roses and pinks have been attacked this year at Antibes by the larvae of *Aphrophora spumaria* (Hemiptera), which reduced the foliage as caused the young shoots to turn yellow. As a rule the damage due to the insect is slight because the larvae appear only in small numbers and toward the end of the season. The ravages of this pest are kept in check by the picking and dusting the plants with quick lime.

- 1224 - Painted Lady Caterpillars damaging Artichokes in France. — TSCHEK, Un parasite de l'artichaut. — *Le Progrès Agricole et Viticole* (Édition de l'Est-Cor) Year 34, No. 29, pp. 88-89, figs. 1-2, Montpellier, July 20, 1913.

The caterpillars of the Painted Lady (*Pyrameis cardui*), which is generally to be found on thistles and mallow in France, occasionally appears in artichoke beds, but its numbers are generally too small for it to be considered as a serious pest.

However, in the spring of 1913, large artichoke beds in the neighbourhood of Hyères were entirely destroyed in a few days by these caterpillars, which then invaded neighbouring plants, including a bed of French beans. Several insecticides were tried, but with little success. The writer suggests that the egg-laying should be carefully watched towards the end of April, and a suitable insecticide used to drive away the butterflies.

- 1225 - *Nysius senecionis* Attacking Recently Planted Vines (1). — PICARD, in *Le Progrès Agricole et Viticole*, Year 30, No. 30, p. 101. Montpellier, July 27, 1912.

This noxious insect (Hemiptera) is very abundant this year on your grafts in many localities in France. The writer recommends the treatment previously mentioned as being the most effective.

(1) See No. 1484, B. Oct. 1912.

— **Some Animal Parasites on *Prunus* in Provence.** — COTTE, J. in *Journal d'Agriculture pratique*, Vol. II, No. 34, pp. 243-244. Paris, August 21, 1913.

The writer has been studying the animal parasites deforming plants in Provence during the last two years and describes those which he has found recently on *Prunus domestica* and *P. spinosa*.

Amongst parasites attacking the leaves (already recorded in other European countries) he mentions: a) *Eriophyes similis*, not widely spread causing little damage; treatment consists of severe pruning and removal of the leaves attacked later by the parasite: it is also kept in check by numerous enemies. b) *Aphis cerasi*, the commonest aphid on plums in Provence. c) *Myzus pruni-mahaleb*, occurs everywhere. d) *Hyalopeltis pruni*. e) *Perrisia tortrix*, not frequent.

As a parasite on buds the writer cites another Cecidomyiid, *Asphondylia prunorum*, which, though long known, has been little studied. It only occurs on plums, but is common on blackthorn, and the writer recommends the destruction of all blackthorn bushes infested with this pest in the neighborhood of plum orchards, or at any rate their treatment with suitable insecticide.

— ***Melittomma insulare* and *Rhina nigra*, Beetles Injurious to Coconuts in Madagascar.** — VUILLER, A. Deux ennemis du Cocotier de la région Malgache. — *L'Agronomie Coloniale*, Year 1, No. 2. pp. 33-37, 1 plate. Paris, August 31, 1913.

The writer describes the life history of *Melittomma insulare* Fairm., its habits and means of combatting it. (1). It occurs in the Seychelles and in the island of Berafia (north-west of Madagascar), where it causes serious damage to coconut plantations; it is probably distributed throughout the Madagascar region.

Rhina nigra Drury also occurs in Madagascar, as well as Berafia, where it has given much trouble. This beetle has been observed to attack trees regularly at a height of 5 feet, though they were already damaged at their base by *Melittomma* beetles. These observations do not agree with those of W. Urich concerning *Rhina barbirostris* (2). The eggs are laid in a small cavity of the bark made by the female and the larvae very soon penetrate into the hardest portions of the wood where they bore numerous galleries.

Preventive measures are adopted against this parasite by covering all wounds in the bark with coal-tar, and using a mixture of thick lime wash and lead arsenate (1 lb. of lead arsenate in 10 gals. lime wash) to destroy eggs laid on the tree trunks. At Berafia the eggs are destroyed by scraping the bark and the application of coal-tar. Trapping the insects by placing sections of decaying stumps in the plantations to attract the male females, and destruction of the larvae by boiling water, might be used with advantage.

(1) See No. 2005, B. June 1911.

(2) See No. 1698, B. Dec. 1912.

1228 - Insect Injurious to Papaw Apples: *Dichocrocis punctifera*. JARVIS, E. in *The Queensland Agricultural Journal*, Vol. XXXI, Part I, pp. 121 Brisbane, July 1913.

A disease of papaya trees was reported from Cleveland in May, and was found to be due to a well-known insect pest, *Dichocrocis punctifera*. Though primarily a maize pest, this insect appears to be extending; it ravages to fruit trees, reports having already been received of its damage to custard apples, oranges, peaches, loquats, cotton and other fruits and so on. The infested trees had their top leaves drooping or dead, their main stems defoliated, with small discoloured fruits hanging from the blackened crowns.

The full-grown moth measures about an inch across the expanded wings, which are pale orange-yellow with numerous dots. It appears at night and lays its eggs on the base of the leaf stalk or occasionally on the fruits. The larvae penetrate the stalk and bore their way to the crown where they pupate. A full-grown larva is nearly an inch long, dirty white in colour, and marked with rows of grey spots. Its head is dark brown; the first segment of a lighter brown colour. It pupates in a loose silken web on the exterior of the crown of the tree.

The following preventive measures are recommended: 1) Spray with arsenate of lead (1 lb. to 50 gallons of water) in the form of a mist spray. This is directed principally against early broods and should be applied early. All trees, profitable or unprofitable, that are liable to be attacked in the neighbourhood should be sprayed. 2) Maize grown as a trap-crop and destroyed immediately the grubs are approaching full size. 3) Destruction of all infested fruit, such as peaches, etc. 4) Avoid planting maize, except as a trap-crop, near orchards.

1129 - Deformation of the Flowers of *Fraxinus Ornus* caused by *Eriophyes fraxini*. — SIRENA, CORLEO SIMONE. Alcune deformazioni del *Fraxinus Ornus* Malpighia, Year XXX, Part V-VI, pp. 512-517. Catania, 1913.

The author has observed certain peculiar gall-like formations on the flowering branches of *Fraxinus Ornus* growing near Palermo. These growths appear here and there on long or more frequently short stalks as irregular shaped masses, somewhat flattened and lobed, of a reddish-brown colour, turgid and more or less glandular. According to the writer they represent floral axes, the numerous protuberances of which are small galls of deformed and aborted flowers surrounded by the rudimentary floral tissue. In some of them a small circular depression is noticeable in the centre, corresponding, perhaps, to the receptacle, but no trace of the pistil is discernible.

These malformations are caused by an acarine pest, *Eriophyes fraxini*, more commonly known as a parasite of the common ash (*F. excelsa*).

The writer has observed that these aborted floral receptacles secrete a sugary liquid which is devoured by ants. This is remarkable, since the flowers of *F. Ornus* do not normally secrete nectar; it may be accounted for by the great quantity of sugar occurring in the sap, especially in summer. Owing to the excessive turgescence of the swellings produced by the insect this sweetish secretion is exuded. It seems to be the first of secretions from acarid galls.

